THE JOURNAL OF THE
NATIONAL SMOKE ABATEMENT SOCIETY

BRIGHTER HOMES

"PHURNACITE" SMOKELESS COAL

NO SMOKE NO SOOT

POWELL DUFFRYN
PHURNOD
SMOKELESS COAL

RADIANT HEAT CONSTANT HOT WATER

BRIGHTER HOMES
WITH
'PHURNOD' SMOKELESS COAL

Specially cleaned, blended and graded for use in
Domestic Hot Water Boilers,
Central Heating Plants,
Slow Combustion Stoves, etc.

"PHURNOD" is not a manufactured fuel, but a NATURAL SMOKELESS COAL as mined at the Collieries of The Powell Duffryn Steam Coal Co. Ltd. in South Wales.

It is :-

EFFICIENT	Owing to its extremely high heating power and freedom from impurities.
SMOKELESS	By reason of its low volatile content, which is, however, sufficient to ensure good burning.
HYGIENIC	Because it is almost free from sulphur.
LABOUR SAVING	Owing to the small amount of ash remaining after combustion and the absence of soot, thus requiring little attention.
ECONOMICAL	Because in the average domestic boiler at the cost of a few pence per day it ensures a continuous hot water supply in addition to the direct heat radiated by the stove.

Please write for current prices and list of Merchants from whom "PHURNOD" Smokeless Coal may be obtained to MESSRS. STEPHENSON CLARKE AND ASSOCIATED COMPANIES LTD., Dept., P.H., 4, St. Dunstan's Alley, LONDON E.C. 3, and Branches.

FOR

SMOKELESS

STEAM RAISING, CENTRAL HEATING, HOT WATER SUPPLY

BY

PRODUCER GAS FIRED BOILERS
OIL FIRED BOILERS
ELECTRO THERMAL STORAGE

and all Modern Methods consult

SAUNDERS & TAYLOR LTD.

ENGINEERS

Praed Rd. Trafford Park,
MANCHESTER.

118-122, Holborn,
LONDON, E.C. 1.

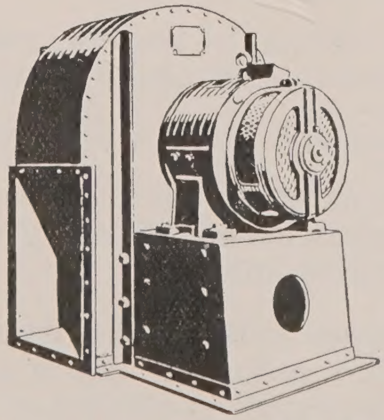
LET US ADVISE YOU ON ALL YOUR PROBLEMS OF

VENTILATING

DUST REMOVING, STEAM REMOVING, REFUSE COLLECTING, INDUCED DRAUGHT AND HEATING, Etc.

EXPERTS IN THE DESIGN, CONSTRUCTION AND APPLICATION OF FANS FOR ALL PURPOSES

Telephone: 6024 CITY



THE "BRADSHAW" ELECTRIC EXHAUSTER

SCHEMES AND ESTIMATES FOR COMPLETE INSTALLATIONS FREE

Efficiency Guaranteed

Telegrams:
"Exhauster, Manchester."

CALL WRITE OR 'PHONE

The Bradshaw Fan & Ventilating Co., Ltd.

134, DEANSGATE, MANCHESTER.

The Journal of the National Smoke Abatement Society

(The Official Quarterly Organ)

Editor: **Arnold Marsh, M.Sc.Tech.**

Editorial Office:
23, King Street
Manchester
Telephone: Central 1218

Advertisement Office:
The Service Guild
45, Deansgate Arcade, Manchester
Telephone: Central 1165

The Journal of the National Smoke Abatement Society. No. 1. Vol. 2.

CONTENTS OF WINTER ISSUE

Page
Commentary 3
R. Morton Rowe: An Interview 5
The Meuse Fog Tragedy 9
The Coal Smoke Abolition Bill 13
The Smoke Problem in Sheffield 13
Correspondence: Statutory Committees .. 17
The Estimation of Atmospheric Impurities .. 18
From the Municipalities and Branches .. 21
Anthracite 25

COMMENTARY

FOG! The descent of a white opaque cloud of vapour from its usual heights to the very surface of the cold earth, which it caresses with a slow and swirling motion. It comes creeping over the fields and down each stream and river, guilefully encircling every house; flowing like a living fluid towards the towns, and encompassing them as if for a seige; making its silent progress down every street and alley; insinuating itself into every nook and corner; feeling its way through the chinks of door and window, and then remaining white and still, like some huge amorphous ghost at rest. At once the roaring traffic of highway and railway is blinded and takes on an unaccustomed tortoise-like gait: in an instant Bradshaw becomes an anachronism. Strange muffled shapes loom up and disappear at once into the unknown, and the *agitato fortissimo* of the streets sinks to a quiet, broken *adagio*, stressed only by the pathetic bleatings of the veiled, timid cars.

* * * * *

Fog! Half a million chimneys thrust their ugly snouts into the thick white cloud and feed it ceaselessly with their dark, thick emanations. And the fog drinks them in with avidity, like a parched sponge takes water. The skeleton of vapour becomes clothed with a flaccid flesh of soot and tar, galvanised by a bitter bloodstream of harsh acids. Now the fog has come into its own. Grey it becomes, or vile murky yellow, cutting off the last remnants of light from the earth, and shrouding the world in a gloom that is more fearful than the dark of deepest night. The malignant demon in it smears his filthy hands over every surface, and sprinkles every stone with acid. Silently he bends down and puffs his foul breath into the face of every passer-by, so that throat and lungs are filled and choked with the poison that is there. And they hurry to their homes, coughing and gasping, miserable and ill, thanking Providence for the health and comfort of the coal fire that awaits them there. . .

* * * * *

We are pleased to be able to announce that the Society has received an official invitation from the Corporation of Liverpool to hold its next Annual Conference in that City. The arrangements for the Conference are now being made, and it will probably be held, as in previous years, towards the end of September. We are certain that members will agree that Liverpool is an excellent place to hold such a conference, not because it needs our assistance more than any other place, but because those who ttend, not knowing the city, will have a week-end well worth while, apart from the meetings of the

Society. Liverpool is a virile place, and possesses an enthusiastic civic ideal which is too frequently absent in her neighbours. There is the fascination of the great river and of the huge docks and landing-stages with their Atlantic liners, and above all, there is that massive symbol of modern enterprise and vision in its highest form, the new Cathedral. And because of her keen social conscience, there is little doubt but that she will welcome us and help to make our meetings profitable and pleasant.

* * * * *

A continuous source of controversy in the smoke abatement world has been the definition of black smoke, and in particular there has never been a standard of measurement put forward which has been satisfactory to everybody. Colour, density, opacity, size of particles, nature of background, direction and strength of light falling upon it, have all been variable factors, which, to correlate in a scientific manner, is a task that has not yet been sucessfully accomplished. The Ministry of Health, realising the need for a clearer definition, has therefore asked the Department of Scientific and Industrial Research to make an investigation into the use of optical methods for giving a truer method of estimating smoke emission. Experimental work has, for some time, been in progress at the Fuel Research Station and Greenwich, and this will now be developed. It is hoped that useful and reliable information will result from this, as success will mean that it may be possible for local authorities to make fuller use of Section 2 (1) of the 1926 Act, which concerns the making of byelaws " regulating the emission of smoke of such colour, density or content as may be described in the byelaws."

Newspaper cuttings reveal that the citizens of those towns which appear highest in the atmospheric deposit returns quickly take umbrage on being told that their town is the dirtiest, or second dirtiest, or so on, place in the country. They are eager to point out that their guages are placed in the worst part of the district, whereas those elsewhere are always put in suburban parks, or that Manchester does not appear in the lists. They will seek for excuses but not for remedies. But nevertheless such criticisms are pertinent. The positions of the gauges is an extremely important factor, as is shown by the large differences which occur in the figures of different gauges from the same station. Thus the total solids recorded at Glasgow vary from 7,556 to 11,848 grams per square dekametre, in two of the eight recording stations. Liverpool, on the other hand has but one gauge, and this brings her second in the list of demerit. There are several other points of importance which must be considered with respect to the value of the present methods of estimating smoke deposit, and we are glad to have the opportunity of publishing Professor Cohen's article on a new suggestion, which appears in this issue.

We publish in this issue a letter criticising the advocacy of regional Statutory Smoke Abatement Committees and also a report of the meeting of the Manchester District Regional Committee. The one is largely answered by the other. " Smoke knows no boundaries " seems to be an excellent slogan for those who are in favour of transferring the control of smoke prevention from the single, frequently apathetic, authorities, to a jointly-controlled regional administration. If each authority could be made to keep the smoke emitted in its area within its own boundaries, the case would be different. It is a pity that the notion is not practicable, but it permits the imagination to proceed to a consideration of every individual smoke producer being compelled to prevent his smoke from leaving his own premises. A dictator less considerate than Dr. Millard might be conceived as saying to every householder : " You may burn soft coal to your heart's content, but you must not permit the smoke from it to escape from your house. Any chimney seen to be emitting smoke will immediately be closed, so that the filth you manufacture can escape only into your kitchen and dining room ! " Fantastic though the idea is, it yet seems to have within it a grain of justice.

Sir Herbert Llewellyn Smith, formerly Chief Economic Advisor to the British Government, makes a plea for smoke abatement in his newly-published book, " London Life and Labour." It is the poorer people who suffer most, he states, as the incidence of the deposit is greatest in the most congested areas. " Grime" he adds, " is one of the worst foes of the amenities of our life, and it means also heavy and constant toil for the over-burdened housewife."

" A comparison between the air of Angus and Mearns and that of Glasgow was made by Councillor A. B. Swan, at the annual dinner last night in Glasgow of the Glasgow Angus and Mearns Benelovent Society. They found consolation in the fact, he said, that the more smoke Glasgow had, the better, brighter, and happier would be the lives of its citizens, for that smoke meant industry."—Glasgow Evening Citizen, December 13th, 1930.

R. Morton Rowe: An Interview

Everybody who is concerned with smoke abatement work knows Mr. R. Morton Rowe, who has just retired from his position as Technical and Chemical Advisor of the Manchester Public Health Department. In this capacity and previously as Chief Smoke Inspector, he has been engaged upon smoke abatement work for about forty years, and there can be few people who have had such a wide experience of all the different aspects of the nuisance, as also, there can be but few who have seen so keenly its manifold consequences and have been so enthusiastic in fighting them. With a view of obtaining some of Mr. Rowe's opinions on the subject I called upon him in the laboratory high up in the Civic Buildings, Manchester, where the Public Health Department is housed.

Mr. Rowe told me that he had known Manchester for forty-eight years, and had been dealing with smoke for forty, and with nothing but smoke for thirty-five of these.

"Do you think that there has been substantial improvement in the atmosphere during the time you have had a special interest in it?" I asked.

"Where, generally, or in Manchester?" he asked cautiously.

"Say Manchester, shall we," I suggested, "it is probably representative of what has happened elsewhere"

"Well, I'm afraid I shall have to say that I consider that the atmosphere has improved very little during the time that I have been here. Thirty-five years ago the smoke from factories was almost inconceivably bad. Numbers of chimneys put out from five to twenty-five minutes of dense black smoke every half-hour. To-day, with the very worst of these same chimneys it would be difficult to observe one minute's black smoke. It is probably underestimating the case when I say that dense black smoke has been reduced by over ninety per cent."

"What do you consider are the main reasons for this improvement?"

He reflected for a moment, and then replied, "It has been brought about primarily by the firm stand which the Manchester Public Health Authority has taken in administering the smoke nuisance clauses of the P.H. Act, 1875—aided by the advent of cheap gas and electricity, and, in the heart of the city, by the provision of hydraulic power by the Corporation. The Public Health Authority has acted in a very wise manner, and whilst, generally speaking, making no allowances beyond the usual concession in the case of ordinary steam boiler practice, yet every case brought forward by the inspectors has been, and still is, considered on its merits. Cases of a very intermittent boiler load, metallurgical and chemical furnaces and stills, and other difficult processes were considered on their individual merits, and time given in many instances for the trouble to be rectified. In some of the more difficult cases several years elapsed before legal action was taken. In this way smoke has gradually been reduced with the minimum hardship to manufacturers. The employment of whole-time inspectors has had a great influence in keeping down the smoke from factories. The knowledge of the presence of an inspector in a district tends to make the firemen more careful."

"If there has been such an improvement with respect to industrial smoke, and the atmosphere is but little better, do you consider that domestic smoke has become worse?" I asked.

"Yes, I attribute the absence of a real improvement to the increase in the number of dwellings. Thirty years ago there were comparatively large tracts of farm land on the outskirts of the city which are now all covered with bricks and mortar."

"But are not fogs less serious now than they used to be? Does not this indicate that there must have been a marked change?"

"Thirty years ago the fogs were absolutely black. I have known it, at midday, be as black as night and impossible to see across the pavement. To-day the character of the fog has altered,—they are more yellow and not so densely black. But on the other hand I am inclined to think that they are quite as venomous as the black. The old fogs were black owing to the carbonaceous matter present, while the modern yellow fog is more characteristic of household smoke. And there is little doubt that household smoke is more dangerous directly than industrial smoke. I have been endeavouring to compare the light tests we have been doing here for the last six years with those that were carried out in 1891 and 1892. It is difficult to obtain a true basis for comparison, but, as far as I can judge, there is very little difference between the two."

"When the London County Council proposed to apply for a byelaw under Section 2 of the 1926 Act, limiting black smoke emission to two minutes in the half-hour there was an outcry from certain groups of manufacturers, who said, in effect, that this byelaw would be unjust and would penalise them unduly. Has the rigorous application of the law in Manchester ever caused an authoritive protest from the industrial interests in that city?"

"There is *no* time limit in Manchester" replied Mr. Rowe, "as I have told people many many times. The Health Committee can institute proceedings for

any emission of black smoke which is a nuisance or injurious to health but it is well understood that they do not usually prosecute for emissions under 2 minutes in the half-hour. If the emission is between one and two minutes the manufacturer will be cautioned. This has been working—and working satisfactorily—for many years, and there has never been any real complaint from the industrialists—except of course, from the actual culprits. Coupled with the wise work of the Committee this method has most certainly been quite fair and there has been no onerous burden laid upon industry."

The next question put to Mr. Rowe was a little less definite in its direction, " Do you think that there are any signs of an awakening of the consciences of both public and manufacturer towards the evils of the smoke nuisance ? "

" There has most certainly been a definite awakening of the public towards the smoke nuisance, and it is realised far more now than it used to be. But,"—he shook his head—" it is only a very small beginning."

" Do you think, Mr. Rowe, that the industrial nuisance has been helped at all by the manufacturers and engineers concerned realising the need for smoke abatement, not only as a public duty, but as a measure of fuel economy which would be of direct benefit to themselves ? "

" I would like to be able to say that I thought the average manufacturer was amenable to persuasion, but I am afraid that if the Public Health Committee had relied on this the results obtained would have been very meagre. The great majority of manufacturers, unfortunately, will not trouble themselves unless compelled to do so."

" So an organisation on the lines of the well-known Hamburg Smoke Abatement League would not have been very successful here ? "

" That is so. I hardly think that it would have worked. The Smoke Abatement League tried to do something in this direction in 1913, but nothing ever came of it."

" Now, Mr. Rowe, here is a question that will give you enough scope to write a book on—Do you consider that the legislation as it stands at present is satisfactory ? "

" The latest legislation, " he replied, " on smoke prevention has done more harm than good. In all essential points it is retrograde, and the only improvement to set off against this is the small increase in penalties (which does not affect Manchester because she could already exact double the amount). The increase in penalty from £5 to £50 about which so much shouting has been heard is little better than—than shouting, as, in Manchester at any rate, a penalty inflicted with the granting of an order is a very rare occurence. The great fault with legislation is the want of adequate provision for uniformity of administration and practice throughout the country. It is ridiculous that Manchester should be straining every endeavour to purify its own atmosphere and that the local authorities surrounding should be doing nothing. It must always be remembered that smoke knows no boundaries"

" And what about domestic smoke ? What do you think are the chief factors to be considered there ? "

" Without a doubt this problem is now the more serious of the two, without minimising in any way the seriousness of the industrial smoke. The chief need is the production of a solid smokeless fuel at reasonable prices. Although gas and electricty can help very much in reducing the amount of smoke, it is an absolute necessity to make some provisions for the smokeless open fire so much loved by the Englishman—a love, I think, which has underlying it a scientific basis. The open fire is almost a necessity in a climate such as ours. So far as I can see this want will have to be supplied by a fuel prepared by the treatment of coal in such a way that it will have all the advantages of a coal fire without the disadvantage of smoke."

" One last question, Mr. Rowe. What in your opinion, is the most serious of all the evils due to smoke ? "

He considered this carefully for a few minutes, but not, I knew, deciding what aspect to mention, but rather how to say what he wished as decisively as possible.

" The biggest evil caused, and the most important reason there is for fighting the smoke nuisance, is that it is, without doubt, lowering the physical standards of the nation. I cannot understand anyone not realising this, considering that the air we breathe is the most vital of all the necessities of life, and of which we use a far greater amount than any other—than of all the others put together, in fact. The effect of the filth and poison in the air we breathe is far greater and more serious than that of a similar quantity present in food and drink. The deprivation of solar radiation through the haze of smoke hanging over our towns is an equally serious feature, as not only are we deprived of actual daylight and sunshine, but there is the even more serious cutting off of the shorter invisible rays, which are such an important factor in the prevention and cure of disease and in keeping the animal body healthy. There are many other evils due to smoke, many of them of immense importance, but this one by itself renders it imperative that smoke must not only be abated, but, finally, must be completely abolished."

I thought that this would be the reply, and would have been disappointed if it had not been. It should be the answer of any one of us.

A.M.

W-D

Our Ideal
"A Smokeless City"

The
WOODALL-DUCKHAM COMPANY
are
manufacturers of
Continuous Vertical Retorts
Intermittent Vertical Chambers
and
Other Plants
for
Conserving Coal
and
Providing Smokeless Fuels

Head Office:-
ALLINGTON HOUSE 136-150 Victoria St., LONDON. S.W.1
District Offices:-
MANCHESTER 78 King St..
GLASGOW 82 Gordon St..
SHEFFIELD 22 High St..
THE WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO.. (1920) LTD..

Spring Cleanliness Every Day

Electricity Ensures Clean Air Everywhere

In your attack on dust and dirt every day your best aid is an Electric Suction Cleaner.

The Electric way of cleaning, collects dirt and allows it to be destroyed without danger to health or scattering the dust everywhere.

It is important in a house where there are children that the floor should be free from germ-carrying dust.

Use Electricity for Lighting, Heating, Cooking and Domestic Help

Send for a free copy of "The House you Want"
issued by
THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.
15, Savoy Street, London, W.C.2.

The Meuse Fog Tragedy

BY ALDERMAN WILL MELLAND, J.P.

To those interested in the question of Smoke Abatement the recent heavy fog in the Valley of the Belgian Meuse resulting in 65 deaths, presents a problem of considerable and, at the same time, tragic importance.

Being in Belgium for the Christmas holidays I took the opportunity of spending a day in Liége with the object of getting first hand information. By pure good luck I happened to meet a Liegéois in Brussels who, when he heard what I contemplated doing, gave me a note of introduction to a banker friend in Liége. This worked wonders for on my arrival in that City early in the morning I presented my card and in half-an-hour had obtained many valuable details of the tragedy and, better still, was passed on to Dr. M. in the City Hospital who, it turned out, had been appointed a member of the Commission set up by the Belgian Government to go into the whole affair and report to Parliament. After three quarters of an hour spent with the doctor I felt I had absorbed a considerable amount of accurate and scientific detail. He expressed himself as being greatly dissatisfied that the Commission had not yet been called together and wondered whether such delay would have been possible in England.

In addition to this source of information I twice had short talks with workmen that I met by chance in the streets.

Liége and, more particularly, the villages of Flemalle, Jemeppe, Ramet-Yvoz, Hermalle, Engis and Amay where the deaths occurred, lie in the valley and are situated on a sort of delta formed by the River Meuse and its two tributaries the Ourthe and Esdre. My banker friend said how much his wife had felt the humidity of the climate compared with Mons, the home of her girlhood.

It was on the morning of Wednesday, December 3rd, an extremely dense fog lay over Liége and the regions round about coupled with a complete absence of wind. Dr. M. Stated that from the higher portion of Liége he had looked down over the valley and noticed a thick and discoloured fog like a lake of cotton wool lying over many of the small towns on the banks of the river and so low that at various points the tops of the works' chimneys showed here and there above the mass of fog. The atmosphere above was quite clear. Seated in his room in the hospital in Liége he could not see across the narrow street outside his window and one of the workmen that I questioned said that he could not see more than 10 feet away. The fog continued till the Friday night and during these three days many of the works and foundries were obliged to cease work.

Reports of acute suffering began coming in during the first day and many deaths took place within 36 hours. Of the 65 victims the big majority were naturally old people often suffering from respiratory and heart trouble but there was one young girl struck down fatally who had a predisposition to tubercular trouble. In addition a number of cows were killed and a parrot. Though there is no record of any other animals being killed there were many, including cats and dogs, that were much distressed by the fog, and which were sent out of the town to recover.

Dr. M. explained the fact of the only animals killed outright being cows by stating that cows have very small lungs in comparison with their large bulk and that, therefore, they find it difficult to respond to any sudden extra demand for respiration that is thrown upon them.

In all the cases most violent irritation of the bronchial tubes had taken place and many people complained of the smarting of their lips and eyes. The banker spoke of a friend who had returned on the Wednesday evening to Liége from Brussels where he had spent the day. Driving in his car from Liége station to his house in one of the towns effected, he began to feel his breathing difficult and very painful. This increased in intensity during the night and it was only on leaving the town that his condition became normal.

Most of the deaths took place on the Friday following the commencement of the fog on the Wednesday and as in Belgium Sunday is the day principally chosen for interment, the following Sunday was a sad one in Liége, which witnessed about 60 funeral processions. The Queen of the Belgians was present and called upon many of the homes of these poor afflicted people.

As regards the cause of this tragedy the outstanding point seems to be that in Liége with its population of a quarter of a million, where the fog was also very dense nothing abnormal happened; the fog was intense but clean, for in Liége, as in most continental towns, there is practically no smoke. All these abnormal deaths occurred in those towns on the banks of the Meuse between Liége and Huy, a distance of about 20 miles. In this area there are probably 60 different kinds of industrial establishments, notably zinc and other foundries, general chemical and artificial manure works, together with engineering shops such as John Cockerill's at Seraing. Dr. M. stated definitely that sulphur dioxide was given off from some of these processes and also hydrofluoric acid and probably small quantities of arsenic compounds. The doctor said that in the case of soldiers asphyxiated by poison gas in the War no traces of such poison could be found in the bodies on post-mortem examination but that the gas was often found and analysed in the men's uniforms which seemed to absorb it and he much regretted that steps had not been taken immediately to conduct similar tests in the case of the fog victims.

Knowing that we, in England, were not entirely ignorant of fog, and its pernicious results he wanted to know if a bad fog, say in London, had ever been known to kill off any number of people in such a short time as 36 hours.

The following is a preliminary list of young people who died as a result of the fog :—

At Jemeppe—Jean Lignesse	aged 37
At Ramet-Yvoz—Georges Perpette ..	„ 30
At Hermalle—M. Havenesse	„ 30
At Engis—Louis Dames	„ 20

and there were quite a number in the forties and fifties.

At the local inquiry which was held very shortly after the damage had been done, several of the witnesses stated that the fog was the very densest in the memory of the inhabitants ; such a dense one had never been seen before. It seemed to grip one by the throat where there was a sensation of burning followed by suffocation and violent coughing.

There seems to have been quite a considerable difference of opinion between the doctors and professor who gave evidence at this enquiry, some stating that the fog alone was responsible for the trouble. They based their opinion purely on the fact that not a single baby had been killed, saying that if there had been acid vapours present in the fog the babies would have been the first to suffer. Others, however, considered that the sufferings of those that had been affected by the fog proved conclusively that the fog had held emanations from the chimneys in the industrial area. It is well-known that the works and foundries are subject to very strict government regulations as regards their different processes and are always subject to the visitation of inspectors from time to time to see that the law is carried out but it remains to be seen whether at the time in question the regulations had been strictly observed by the owners of the works.

It appears that this is not the first time that such a visitation has happened for in 1911, 12 deaths took place as the result of an unusually thick fog though at that time no great notice was taken of the occurrence.

On my asking the labouring man that I met in the street near the railway station what happened to the men who worked all their lives in the various works and foundries, he replied that as a rule they were finished at 40, that is either dead or invalided out of service. Everything considered and especially the fact that in Liége itself where the fog also lay thick no abnormal deaths occurred, it is difficult to decide otherwise than that it was the gaseous fumes from the industrial chimneys imprisoned in the fog that were mainly responsible for the holocaust.

We in this country are so accustomed to the massacre of the innocents, young and old, that it is taken almost as a matter of course that large numbers are literally killed off by the filthy atmosphere in our smoke ridden towns, especially during foggy weather. We are tragically thrilled at the news of fatal railway, automobile or flying accidents or loss of life by fire or tempest, but the hastening on of invalidism and death by loss of the sun's rays and the directly burning acid condition in smoky air does not interest the nation as a whole.

This was clearly seen as long ago as 1661, when John Evelyn, in "Fumifugium," the first smoke abatement pamphlet, said :—

"The consequence then of all this is, that almost one half of them that perish in London, dye of Phthisical and Pulmonic distempers ; That the Inhabitants are never free from Coughs and importunate Rheumatisms spitting of Impostumated and corrupt matter ; for remedy whereof there is none so infallible as that, in time, the Patient change his Air, and removes into the Country."

(*The above article appeared in the "Manchester Guardian" on January 13th*).

"Fog is not tolerable for being seasonable . . . it is compounded of industrial grime, and oppresses the spirit. It hangs over cities, somehow making tangible and immanent the squalor that is in them, and on which they batten. It is an aerial slum."—The Manchester Guardian.

Sir Frank Baines, giving evidence at the inquiry by the Electricity Commissioners into the application of the Fulham Borough Council for consent to extend their generating station, stated that he calculated that, as a result of atmospheric impurities, the damage to buildings throughout the country had cost the nation from £55,000,000 to £60,000,000, during the last half-century.

"The fireman who will not put his brains into the theory side of his job will probably never get any further than putting his back into the firing of a boiler."—Mr. Edgar Lunn, Hon. Secretary of the Huddersfield Smoke Abatement Council.

"Merely to burn coal as we do now, especially in the domestic grate, is a crime. If the enormity of the offence is not yet understood by the people, at least the chemist realises its import, and the progress made, going no further back than the last decade, is all to our credit. Raw coal should be forbidden in a town ; it would be if we had any conscience and eschewed politics in local government."—Dr. E. F. Armstrong, formerly President of the Society of Chemical Indfstry

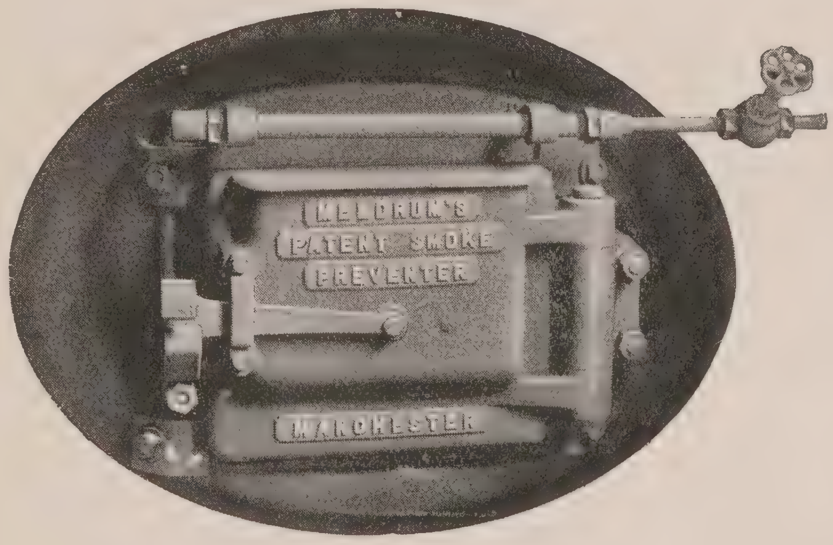
SMOKE-CURE WITH SAVINGS—
THE "MELDRUM" WAY

POSITIVE FEATURES (not found on any other system)

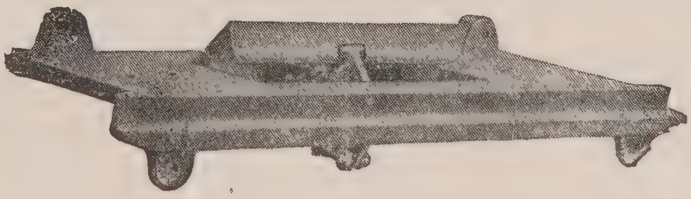
PRODUCE POSITIVE RESULTS.

The " Meldrum " System utilises a closed Ashpit under positive pressure so that the admission of secondary air is not dependent upon Chimney pull but is produced **under the Firebed** and its effect is instantaneous and quite independent of atmospheric conditions. In the case of

THE HANDFIRED FORCED DRAUGHT FURNACE :—

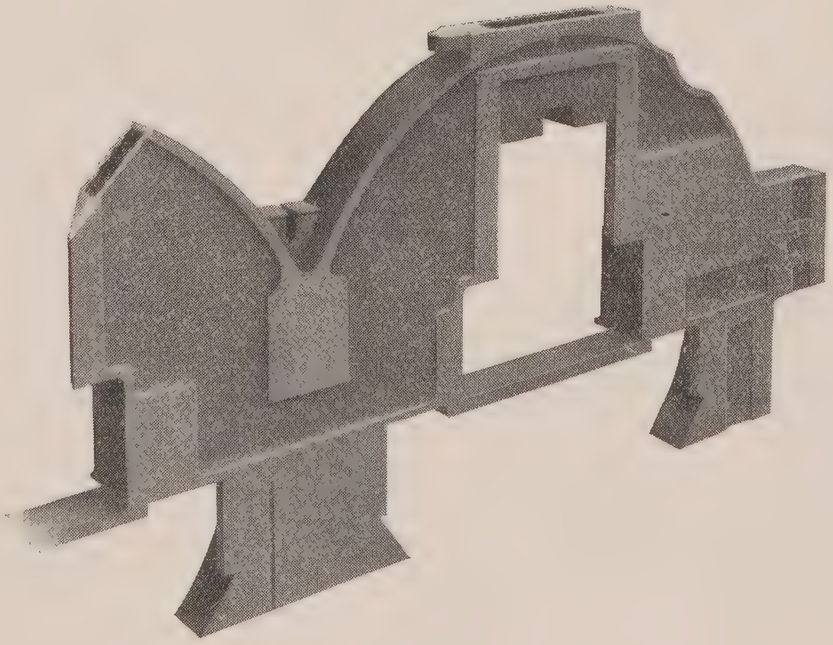


For Vertical Cochran & Loco. Type Boilers—A double or hollow door takes the place of the ordinary firedoor, As will be seen, secondary air is forced down and through this door by steam-jet under control by Wheel Valve.



For Lancs., Cornish, Marine and Yorkshire Type Boilers also Coppers, Kilns & Heating Furnaces :— A Valve in the deadplate (2nd view) opens automatically by the closing of the firedoor. This valve is connected with the closed ashpit under pressure.

Mechanical Stokers :—As bottom view shows a double or hollow Stoker front is used —air is forced down and through this and comes out into the flue—controlled by wheel valves.



MELDRUMS Limited
TIMPERLEY
Nr. Manchester
and 108, Victoria Street,
Westminster, London.

FOR CLEAN AIR AND
MAXIMUM SUNLIGHT

USE THE SMOKELESS COAL
NATURE HAS HERSELF PROVIDED

ANTHRACITE

ABSOLUTELY SMOKELESS
HIGHEST IN CARBON, LOWEST IN ASH
VERY SLOW BURNING
SAFE, CLEAN AND ECONOMICAL IN USE
MINIMUM ATTENTION—IT NEVER GOES OUT

THE BEST FUEL FOR—
DOMESTIC HOT WATER BOILERS
CENTRAL HEATING
OFFICE, WAREHOUSE, GREENHOUSE AND GARAGE HEATING

ENQUIRIES AND DESCRIPTIVE LEAFLETS :—

AMALGAMATED ANTHRACITE COLLIERIES LTD.
120, FENCHURCH STREET,
LONDON, E.C. 3.

Leicester Conference.

The Coal Smoke Abolition Bill

Dr. C. Killick Millard, Medical Officer of Health for Leicester, occupied the chair at the second session of the Society's Annual Conference in that City, and in his opening remarks stated that he had drafted a bill for the total abolition of coal smoke, which he would at once put into operation if he became Dictator of the country. The Bill, which is printed in full below, caused much amusement among the members present.

Coal Smoke Abolition Bill.

A Bill to secure the Total Abolition of Nuisance from Coal Smoke.

To our Faithful and Beloved Fellow Subjects. GREETING: WHEREAS it has been abundantly proved that pollution of the atmosphere by coal smoke is highly injurious to the physical health and mental welfare of human beings, is very destructive of buildings, causes much injury to fabrics, entails great and unnecessary expenditure upon laundering, impedes aviation and endangers the lives of persons travelling by air, and generally is a direct cause of much discomfort and inconvenience;

AND WHEREAS the burning of raw coal is both wasteful and unnecessary;

NOW THEREFORE WE, by the Grace of God and of our Gracious Sovereign King George V., and by virtue of the trust which is imposed in Us, Dictator of this Realm, Reformer of Abuses, and General Benefactor, do hereby enact as follows:

1. Within twelve months from the day on which this Act comes into force (hereinafter referred to as the Appointed Day) all coal produced in or imported into this country for the purpose of combustion in a raw state will be subject to a tax of one shilling per ton.

2. At the end of a further twelve months the tax will be raised to two shillings per ton.

3. Such a tax to be further increased by one shilling per ton every twelve months for so long as may be necessary, i.e., until such time as no raw coal is being used except as hereinafter provided for.

4. All coal used for the manufacture of gas, electricity, solid smokeless fuels or other approved coal substitutes shall be exempt from the above tax.

5. Factory proprietors and others engaged in industry who desire to continue using raw coal on the ground that a satisfactory solid smokeless fuel is not easily obtainable in sufficient quantity at a sufficiently low price to obtain a rebate of the tax on production of a certificate from the Regional Smoke Prevention Board that they are able to burn raw coal without the emission of black smoke, such certificate only to be granted or renewed where the emission of black smoke does not exceed the time limit set forth in the First Schedule to this Act. (It is suggested that the limit should be one minute in the half hour).

6. At the end of five years from the Appointed Day, or after such further time as We, in our Wisdom, may decide, the burning of raw coal will be entirely prohibited. (It is anticipated that by that time the supply of solid smokeless fuel will be adequate for the needs of the whole community); Provided however, that this clause will not be enforced in the case of certain industries (e.g.) the manufacture of high-grade steel), if it can be shown, to the satisfaction of the Smoke Prevention Board, that the burning of raw coal is essential to such business.

Then follow provisions for the spending of the revenue resulting from the raw coal tax.

1. PROPAGANDA. Especially in schools.
2. SUBSIDIES. To assist in the provision of works for the manufacture of smokeless fuels, improved types of firegrates and other apparatus for the burning of smokeless fuel, etc.
3. RESEARCH.

Leicester Conference.

The Smoke Problem in Sheffield

The Report by Mr. F. J. Bailey and Mr. E. C. Evans on the position of smoke abatement in Sheffield, presented to the Sheffield Manufacturers' Smoke Abatement Research Committee, was discussed at the Leicester Conference. We give below extracts from the Report itself, together with an account of the discussion, which has been abstracted from the "Gas World."

Considerable success has been achieved by the total gasification of coal in separate producer plants and firing the furnaces with the producer gas. This makes it possible to achieve a continuous uniform supply of fuel to the furnace and thus increases the ability to obtain the control of furnace atmosphere necessary to smokeless operation. Unless great care is taken, however, both the pressure in the gas mains and the quality of the gas vary considerably, making it difficult to achieve the great delicacy necessary for the protection of the surfaces of special steels. In other words, the care in control is largely removed from the furnace operator, but the responsibility is at the same time diverted to the gas maker, and this fact must be fully realised if the quality of the work is not to be impaired. Moreover, producer gas fired furnaces are considered not to be economic when the production is intermittent, which is an outstanding feature of the "jobbing" work typical of Sheffield. A further difficulty arises from the cleaning of gas mains which must be burned out once a week. Thus, an installation which is satisfactory and reasonably smokeless over the period of a week must emit quantities of soot over a considerable period at the end of that time, since no clean method of removing the accumulations from the gas mains appears to have been developed.

Coke Oven Gas Firing.

The most perfect control with the greatest flexibility in operation can be attained where gas of a constant quality is supplied at a constant pressure and temperature and is utilised in a properly designed furnace, the proportioning of gas and air being automatic. The nearest approach to this is town's gas, *i.e.*, coke oven gas, which is now being used increasingly for those heat treatment operations where the greatest care is necessary. A further advantage to be gained from the use of coke oven gas is that low temperature operations, which are normally responsible for heavy smoke emission, are carried out smokelessly.

It is not possible at the present time to say precisely what will be the full field of application for coke oven gas, since the use of it has so far been restricted on the score of price. The Area Gas Supply Committee, which investigated the problem of utilisation of surplus coke oven gas, considered a scheme whereby in the comparatively near future it is hoped to make available this gas to the works at a cost which may make it attractive.

It will be necessary, before this gas can be used to its full advantage and contribute its full quota towards reducing the present smoke emission, to undertake a great deal of development work in order to adapt the furnace designs to the metallurgical operations involved. The opinion has been stongly expressed by the majority of the firms with whom the subject has been discussed that this can and will be done efficiently, since there is ample technical ability available in the industry.

Oil and electricity both have particular fields of application and specific advantages in addition to smokelessness, but in general they are ruled out on the score of cost, at least for anything other than small work in which heating costs are only a small proportion of the overall production costs or where space is an all-important consideration.

Some of the Difficulties.

Generally speaking, the survey that has been made indicates that with respect to most of the products made in Sheffield, manufacturers are attempting the solution along the lines of control of furnace atmospheres, coupled with continuity of fuel feed. Even in cases, however, where this has been done, it has been pointed out at other works in the same group that serious difficulty would arise in adopting similar methods, owing, possibly, to the layout of the works, capital cost involved and other specific factors.

In one particular section of the industry, however, namely, that dealing with high quality thin sheets having the "Sheffield finish," special problems arise, and no evidence was obtained from any of the works visited that the problem of smoke prevention could be more than mitigated at certain stages of the furnace operation. It has been suggested that the heavy smoke emitted when "burning in a furnace bottom" can be obviated by commencing with coke as the body of the fire and then subsequently covering this with a relatively thin layer of coal.

It has been claimed that the adoption of certain specific types of gas fired furnaces, modified, perhaps to meet the special needs of this section of the industry, would solve the smoke problems involved, but this matter is still under investigation by the manufacturers.

Other metallurgical fumes, such as those arising from converters and also those from the "ore-ing" of the open hearth plants, are now included in the legislation as a result of the new Act. There do not appear to be any methods of obviating these fumes at present, and owing to the normal height of open hearth furnace chimneys, these emissions would not appear to be serious.

Treatment of Exit Gases.

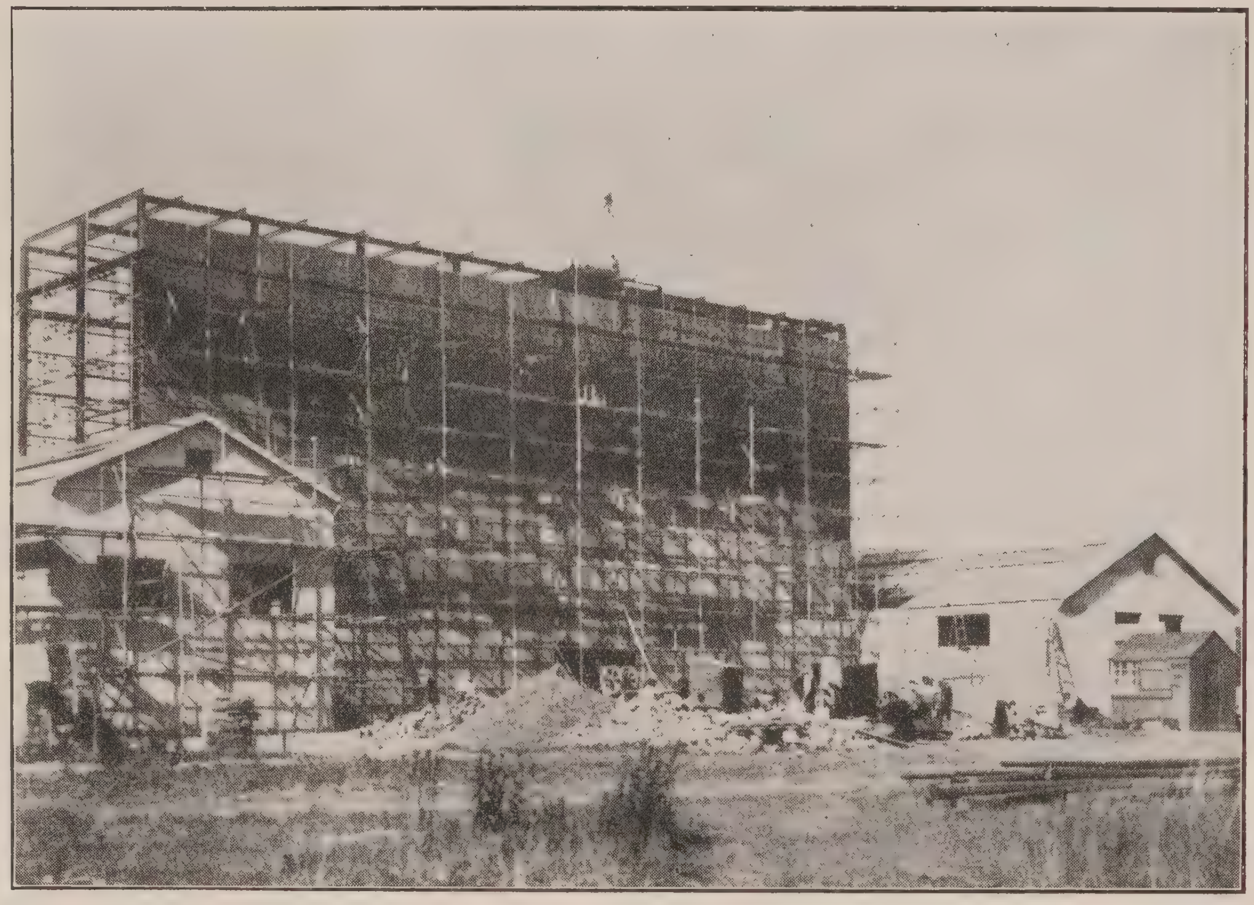
Consideration has been given by many Sheffield firms to the elimination of smoke by treatment of the exit gases, and some attempts have been made along these lines.

If air is added immediately after the gases leave the furnace and the temperature of the gases and the air are both sufficiently high, it is possible to burn completely all the smoke which may be carried to that point. If, however, for any reason, the temperature drops below that which is requisite, smoke will no longer ignite and the device is useless.

In general, there are two difficulties which are to be overcome before complete success can be achieved by any means of after treatment. First, the installation and running costs must be exceedingly low, since very little cash return can be expected, and, secondly, the device must be simple and interfere as little as possible with the draught of the furnace.

Another aspect of the general problem upon which great stress is laid is that of the "human element"

The Best Way to Reduce Smoke is to Economize Fuel by Insulation



The greater part of this factory will be kept at a temperature of 160° F but the walls and roofs are only $3\frac{1}{2}''$ thick because they are made of THATCHBOARD. It is such an excellent insulator, however, that this factory will require only half the heating plant of one constructed of brick.

THIS MEANS THAT BY THE USE OF THATCHBOARD HALF THE SMOKE HAS BEEN ELIMINATED. If similar construction were extended to all new buildings the smoke problem would be largely Solved.

Ordinary building materials provide very little insulation. For instance 28″ Brickwork in outside walls is only equivalent to 2″ THATCHBOARD.

Therefore, the fuel consumed in heating buildings having brick or masonry walls and tiled or slated roofs is largely wasted in heating the outside air unless insulation is introduced. It has been proved that by using insulation from 30% to 50% of this fuel can be saved.

THATCHBOARD is unique in being an excellent insulator as well as a building material. It replaces other materials and, therefore, buildings in which it is used cost no more to build than uninsulated ones.

Insulate buildings in order to save waste, reduce smoke & increase comfort.

Heat & Sound Insulation Ltd.

Craven House
16, Northumberland Avenue, London

Telephone: Gerrard 8632, 8633 **Telegrams: "Durothatch, Westrand"**

Wipe Away the Greyness;

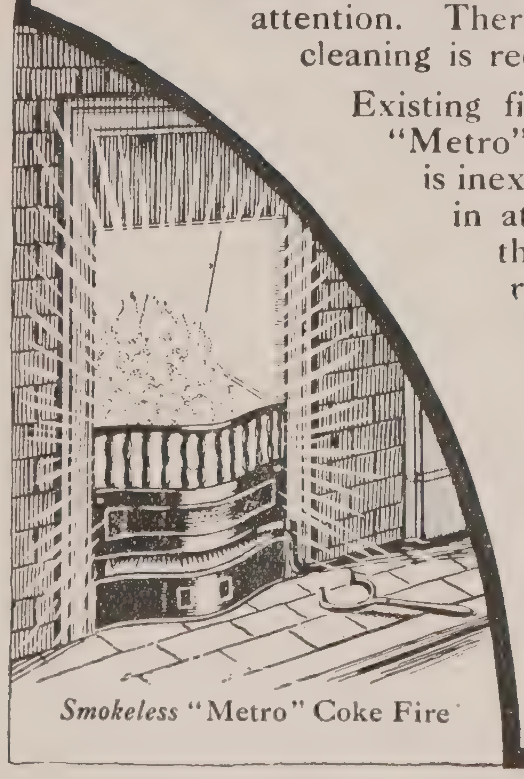
Let Health-Giving Sunlight Into Your Homes.

Every "Metro" coke fire in use helps to reduce the smoke pall which brings disease in its train.

"Metro" coke fires burn clean, inexpensive fuel. They are quickly ignited by a gas burner and burn brightly without attention. There is no smoke, consequently room cleaning is reduced.

Existing fireplaces are easily altered to take "Metro" coke-burning grates. The alteration is inexpensive. "Metro" grates are made in attractive designs costing from 20/-; the saving in labour and fuel soon repays the cost. Apply to your local Gas Undertaking or Ironmonger, or write for a free illustrated list to

SIDNEY FLAVEL
&CO. Ltd. STOVEMAKERS SINCE THE REIGN *of* KING GEORGE III
LEAMINGTON



Smokeless "Metro" Coke Fire

in dealing with furnace work. From the technical viewpoint, it is always assumed that the furnaces and control devices are properly used. Even the most carefully designed coal fired furnaces can be made to smoke, and accordingly the fool-proof furnace is as yet a vague ideal of the future. On the other hand, care and skill in firing will do a great deal towards mitigation of smoke emission with extremely simple furnace designs, while at the same time giving ample protection to the metal surfaces.

A great deal of work has been done and is still being done by Sheffield firms towards applying the well-known principles of combustion to the solution of the many problems involved in the progressive reduction of smoke emission by the Sheffield industry.

Discussion.

Mr. Evans, commenting on the report, said there were great possibilities for coke oven gas for the majority of Sheffield products. Sheffield was the centre of a very big coke oven industry, and he thought that the use of this gas as fuel in the place of raw coal would help to solve the city's smoke problem in respect of as much as 80 per cent. of its products. One difficulty that would remain would be in respect of Sheffield sheets which were used for the manufacture of hacksaws, razor blades and other cutting tools. Manufacturers had already spent considerable sums of money in trying to carry through the various processes attached to the making of these sheets without smoke, but as yet without success. They were not without hope, however, that good results would follow the joint researches by the manufacturers, the local authorities and the Department of Scientific and Industrial Research.

Dr. E. W. Smith (London) pointed out that there were 40 million cubic feet of gas per day generated in the coke ovens of the Sheffield district which could be converted for use for town and other purposes. If this could be used for industrial purposes, he contended that it would go a long way towards the cure of the smoke nuisance. Naturally, the coke oven people wanted as high a price as possible for their product, but the manufacturer had in mind the cost of producer gas. If agreement on the question of price could only be reached, there was a supply of 40 million cubic feet per day available and in the course of the next few years this quantity would be doubled. It was not sufficient to look to the domestic supply to relieve the situation, because the highest load in this direction was a mere flea-bite as compared with the total supply available.

Dr. Smith urged the people of Sheffield to get a move on and end the deadlock which at present existed between the various people interested. If not, the Government should end it by setting up a grid distributing system, buying the gas, selling it out to those who required it and be responsible for the whole thing. It was far too important a matter to be allowed to drag on simply because it was a question of a difference of opinion between the three interests concerned.

Price Problems.

Commenting on the economic selling price of coke oven gas and gas produced by commercial undertakings, Dr. Smith said that the one could be produced as cheaply as the other, but the public companies had to take into account the cost of distribution. It did not pay to take gas very long distances, and the way in which gas was distributed was relatively costly, because the whole system had to provide for the maximum demand likely to be made upon it—a demand which, after all, existed only for a short period of each day.

Dr. Smith then suggested that an enormous advantage might be gained if the gas companies could charge for their products on the lines now followed by the electricity undertakings. There should be a standard charge per house for the installation and a minimum quantity of gas with a further charge and a different rate above this minimum quantity. He was of opinion that if this were done, the price of gas could be brought down very rapidly.

Mr. W. Asbury, chairman of the Sheffield Public Health Committee, said it must be remembered that the manufacturers had themselves already admitted that the emission of a great deal of black smoke was unnecessary. He was watching with great interest the researches of the Sheffield University into the manner in which use could be made of the smoke. Surely, he said, it should not be beyond the wit and intelligence of man to devise ways and means of turning smoke to good account, instead of broadcasting it to the detriment of one's fellow human beings.

Correspondence

Statutory Committees.

The Editor, J.N.S.A.S.

DEAR SIR,

With reference to the paragraphs which appeared in your last issue, I beg to state my reasons for not believing that the formation of Statutory Smoke Abatement committees will of necessity prove to be beneficial in all cases.

First of all, I think it largely depends upon the size of the area covered as to whether such a Joint Statutory Committee as is established at Sheffield and Rotherham can operate efficiently and economically. In the case of the West Riding of Yorkshire, a very large staff of special smoke inspectors with the necessary clerical assistance would have to be provided in order to carry out the work now carried out by the individual sanitary inspectors in their respective districts.

Secondly, with respect to the efficiency of inspection, in view of the fact that many sanitary inspectors now possess the special certificate of the Royal Sanitary Institute for smoke inspectors, can it be maintained that there would be any better inspection carried out by a special body of smoke inspectors? In my opinion any special advantage the latter may possess in view of the fact that they would have to deal with the one subject only, would be nullified by the local inspector's particular knowledge of local conditions, and better facilities for establishing and maintaining contact with offending firms.

Thirdly, does it necessarily follow that a larger committee having jurisdiction over the areas of several local authorities, will carry out their duties any better or more impartially than the individual councils? I do not think so. With respect to defaulting local authorities it should be remembered that under Section 108 of the Public Health Act, 1875, a local authority has power to proceed where the cause of the nuisance arises outside their district.

Finally, a Joint Statutory Committee cannot co-operate with the manufacturers in the area to the same extent and in the same way as a purely advisory committee with no statutory power. We hear a great deal nowadays of the advantages of co-operative and educational methods over those on a compulsory basis. In the West Riding of Yorkshire at any rate, we have established not only a Regional Smoke Abatement Committee consisting of representatives of local authorities within the area and certain co-opted members with special knowledge of and interest in smoke abatement work, but an Advisory Committee which consists of (1) representatives of the various Chambers of Commerce within the area, (2) representatives of the Regional Smoke Abatement Committee, and (3) representatives from the Fuel Research Department of the Leeds University. With the full approval and co-operation of this latter committee, the parent committee has elected an Examination Board consisting of Members of the Regional Committee, Principals of Technical Colleges, representatives of the Leeds University, and engineering experts. This Board, in conjunction with educational authorities throughout the area, has now issued a standard syllabus of the course of training for stokers and boiler firemen along with regulations for their examination, and at present there are no less than 11 centres in which these standardized courses of training are being held. It must also be remembered that this is in our first season. We are already assured that there will be many more next year. Could a Joint Statutory Committee carry out such work as this?

I do maintain that in our area at least, the course of smoke abatement does not suffer by reason of the fact that there is no Joint Statutory Committee in existence, and suggest that the present Regional Smoke Abatement Committee can do more useful work as at present constituted than it could if endowed with statutory powers.

Yours faithfully,
JOHN W. BEAUMONT,
Chief Sanitary Inspector.

Health Department,
Halifax.

The Estimation of Atmospheric Impurities

BY PROF. J. B. COHEN, Ph.D., D.Sc., LL.D., F.R.S.

The Air Pollution Committee of the Meterological Department issues at intervals reports of the insoluble and soluble matter which is assumed to be carried down by rain and collected in open receptacles. This method, which, I believe, was originally introduced by Dr. Ruston and myself and described in "Smoke, a Study of Town Air" was used by us as a rough test of the amount of impurity in the air at different parts of the town of Leeds. Its object was to obtain a rough comparison between the residential and industrial areas. The method was never regarded as strictly scientific, for the simple reason that its accuracy had never been tested. It is open to certain criticisms, the chief being the extent to which the direction and strength of the wind, the environment and the nature of the ground may contribute to the dissemination of dust which may find its way, not from the air, but from the ground into the open vessel. As far as my knowledge goes no attempt has been made to settle these points.

The process of analysis is a lengthy, delicate and laborous operation, the four receptacles in Leeds requiring, so I am told, a fortnight's work of a trained chemist each time they are examined.

Meantime periodical reports are issued for a number of centres in many different towns, and may or may not represent an accurate record of what they are intended to convey.

My object is not so much to criticize the present method of estimating impurities in the air, as adopted by the Air Pollution Committee, as to suggest a much simpler and to my mind a more instructive method for attaining the desired object. The most deleterious part

Wipe out that smoke!

"BENNIS" STOKERS

ensure

ABSOLUTELY SMOKELESS COMBUSTION

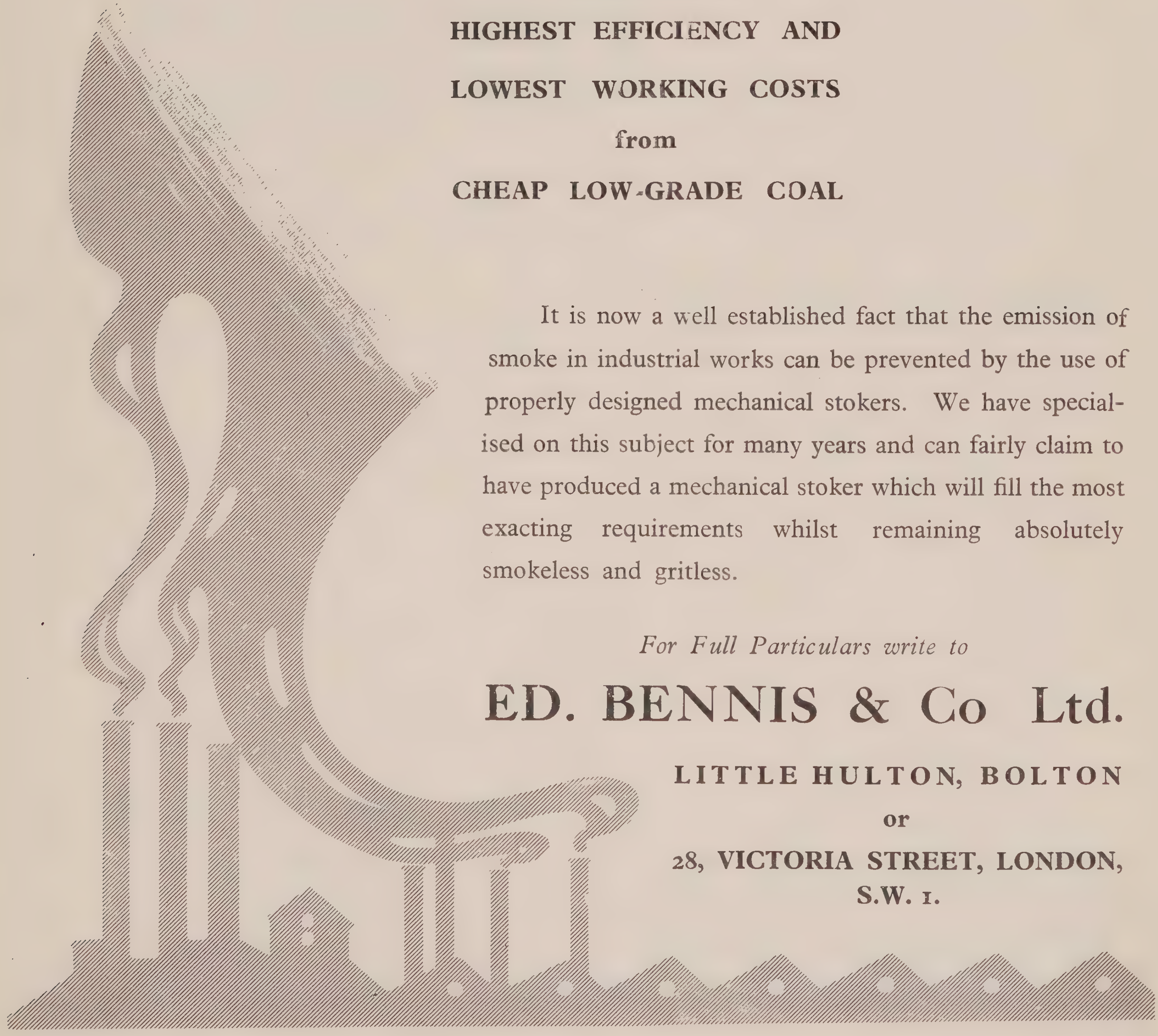
combined with

HIGHEST EFFICIENCY AND

LOWEST WORKING COSTS

from

CHEAP LOW-GRADE COAL

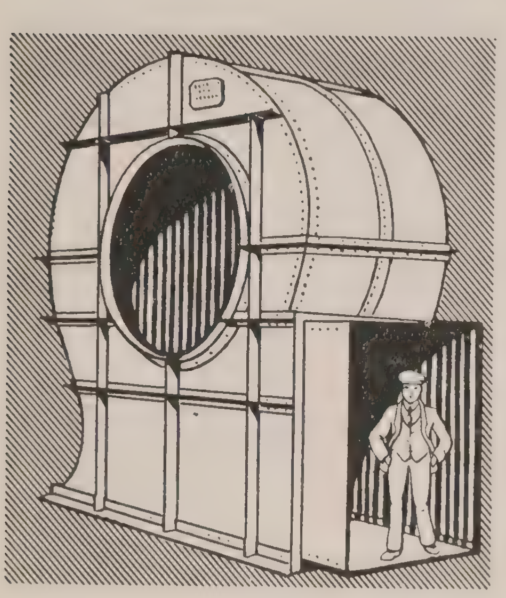


It is now a well established fact that the emission of smoke in industrial works can be prevented by the use of properly designed mechanical stokers. We have specialised on this subject for many years and can fairly claim to have produced a mechanical stoker which will fill the most exacting requirements whilst remaining absolutely smokeless and gritless.

For Full Particulars write to

ED. BENNIS & Co Ltd.

LITTLE HULTON, BOLTON
or
28, VICTORIA STREET, LONDON,
S.W. 1.



‘CYCLONE’ FANS

for induced draught

INDUCED draught for Steam Boilers offers innumerable economies, and to prefer the “Cyclone” system of Induced Draught is the initial economy. Its scientific application of the principles involved and its reasonable cost to instal make it of first consideration.

MORE STEAM—LESS COAL—ELIMINATES BLACK SMOKE

These are the primary advantages the “ yclone” System ensures. Saves you as much as 25% of fuel, and definitely increases boiler efficiency. New boiler houses fitted with “Cyclone” do not need tall chimneys.

Write for explanatory Booklet 66 *F*

MATTHEWS
& YATES LTD
SWINTON MANCHESTER

©

JOHN TURTON & SONS

M. I. P.

PLUMBERS

Domestic Hot and Cold Water
— Fitters in all Metals by —
Smokeless Fuel, Gas or Electricity
Sanitary and Heating Engineers.

Estimates Given.

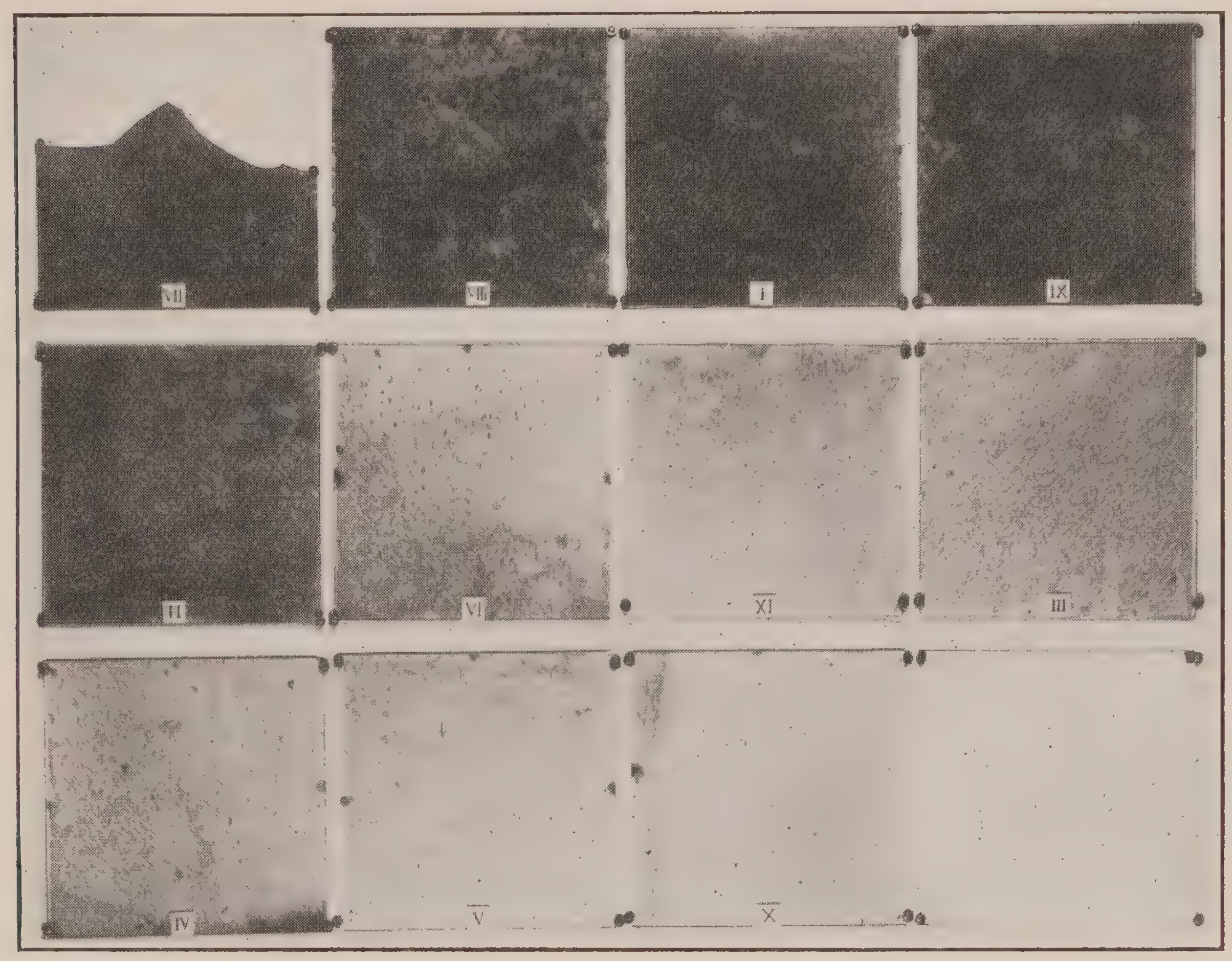
43/45, Higher Cambridge Street,
Chorlton-on-Medlock, Manchester

The Journal of The National Smoke Abatement Society

is the only official journal of the National Smoke Abatement Society. There is no waste circulation. Every copy goes into the hands of those interested—commercially and technically—in the successful solving of the smoke problem.

Application for advertising rates should be made to—

The Service Guild
45, Deansgate Arcade,
Manchester
Telephone : Central 1165.



of soot is that portion which is charged with tar and which is characteristic of the product of the domestic chimney. Where it falls it sticks and is not removed by rain. It is this sticky and acid tar which settles on and discolours buildings, disintegrates masonry and rapidly destroys corrugated iron and wire netting. I understand, too, that where it settles on the porcelain insulators carrying high tension current, it produces a conducting surface which is presenting a serious problem to the electrical engineer. Now by the simple expedient of placing glass plates of say a foot square in a horizontal position in appropriate places and leaving them for three or six months and washing off the loose matter under the tap, the plate will present a fairly homogeneous surface of a lighter or deeper shade of sticky tar, which for comparison could be referred to a series of standards or examined by the amount of light obscured from a standard lamp. It is obvious that very little work is involved in such determinations; but the main advantage is that the comparison does not include loose dirt, but only that portion of the soot which really matters, namely, the acid tar.

The accompanying photograph represents a series of plates, placed in different parts of the town of Leeds and exposed for six months from April 1st to October 1st, the one in the bottom right-hand corner being a clean unexposed plate for comparison.

From the Municipalities and Branches

EXAMINATION FOR STOKERS.

The West Riding Committee's Scheme.

The West Riding of Yorkshire Regional Smoke Abatement Committee has drawn up, in conjunction with the various courses of instruction for stokers and firemen in the area, a scheme for examinations, with the granting of certificates for successful candidates.

An Examination Board has been set up, and this will determine the places where examinations shall be held, and the nature of the tests. The examination will consist of three parts, as follows:—

(*a*) *Written.* To consist of a paper of eight questions of which six must be answered. Time allowed—two hours.

(*b*) *Oral.* To take place in conjunction with the practical examination, and to deal more particularly with the practical details of boiler-house routine and smoke abatement.

(*c*) *Practical.* To be held at the boiler front, where the candidate shall be required to display his knowledge of the general structure of the boiler and its fittings, its firing, regulation of air, etc.

Candidates must have attended one of the schools in the area at which courses are given, must give evidence of good conduct and industry from their employer, and must have had practical experience in boiler firing or management. The syllabus which the examination will cover, consists of the following subjects: Part 1. Smoke, fuel, combustion, heat transmission, boilers, firegrates and bridges, firing methods, draught, feed water, and general survey of effective methods of working efficiently without smoke.

Part 2. will deal with these points to a more advanced degree, and will also consider boiler house instruments and auxiliaries, such as economisers and steam accumulators, and the keeping of records.

Manchester and District Regional Smoke Abatement Committee.

The half-yearly meeting of the Committee was held in the Lord Mayor's Parlour, Town Hall, Manchester, on November 25th, Alderman W. T. Jackson, J.P. presiding. The chief business of the meeting was the consideration of a report which had been prepared by the Executive Committee, on an instruction of a previous meeting of the Regional Committee.

This report dealt with the advisability of the formation of a joint statutory committee, and considered fully the effects of smoke on health and the administrative side of the work. It was pointed out that the amount of dense black smoke averaged over 536 observations taken in 33 districts around Manchester amounted to 9.3 minutes in each half-hour: whilst the same number of observations in Manchester averaged 1.8 minutes. Moreover, in the out-districts the 536 observations were obtained in 42 working days, whilst it took 1,300 working days to obtain the same number in Manchester. It was resolved to request the Lord Mayor of Manchester to call a conference of the Mayors, Chairmen of Councils and Chairmen of Health Committees to consider the need for joint statutory action in the area.

After the close of the business the delegates were addressed by Professor J. B. Cohen, Ph.D., D.Sc., F.R.S., on the effects of smoke on plant life, illustrated by lantern slides.

The Lord Mayor of Manchester had acceeded to the request of the Committee, and arrangements are now being made for a Conference to be held in February.

Scottish Branch.

At a meeting of the Scottish Branch Executive Committee reference was made again to the fact that when the Public Health (Smoke Abatement) Act 1926 (which applies to England and Wales only) was passed, a promise was given that similar legislation for Scotland would be promoted, and although resolutions have been passed at various meetings of the Branch, and representations have been sent to the Secretary of State, no such legislation has been promoted. A further resolution was adopted and forwarded to the Secretary of State, copies being sent to the Scottish Local Authorities, asking them to support the resolution. The resolution reads as follows:—

> "That representations be sent to the Secretary of State for Scotland urging that a Smoke Abatement Bill be promoted giving to Scotland similar powers to those granted to England and Wales by the Public Health (Smoke Abatement) Act 1926."

In addition the Branch has sent a letter to the Minister of Transport relative to the emission of smoke and steam from vehicles on streets or roads, and requesting him to make regulations in terms of the powers conferred upon him by Section 30 (1) (*b*) of the Road Traffic Act, 1930. This question will also be discussed by the National Executive on the occasion of its next meeting.

The L.C.C. Byelaw.

Following objections raised by certain industrial organisations the London County Council has revised its proposed byelaw with respect to the emission of black smoke, and has afforded a compromise by formulating the following, which has been accepted by the manufacturers:—

"The emission of black smoke for a period of three minutes, and after five years from the date of the confirmation of this byelaw, for a period of two minutes in the aggregate within any continuous period of thirty minutes from any one chimney of a building other than a private dwelling-house shall, until the contrary is proved, be presumed to be a nuisance liable to be dealt with summarily under the Public Health (London) Act, 1891."

"Provided that nothing in this byelaw shall extend to the emission of smoke from a chimney of a building (not being a chimney of a building or part of a building mainly used for steam-raising) used for the following processes, that is to say, the smelting of ores and minerals, the calcining, puddling and rolling of iron and other metals, the conversion of pig iron into wrought iron, the re-heating, annealing, hardening, forging, converting and carburising of iron and other metals, and the manufacture of glass, so as to obstruct or interfere with any of such processes respectively, or to the emission of smoke from a kiln which is fed with fuel otherwise than from above."

Thus, in five years time, the position will be the same in London as it has been in many areas for a quarter of a century or more.

Manchester and District Branch.

A successful meeting of the Manchester Salford and District Branch was held on Monday, December 15th, in spite of the city being shrouded in a thick smoke fog. The speakers were Principal B. Mouat Jones, of the College of Technology and Dr. R. Veitch Clark,

Smoke and Disease

Smoke is perhaps the gravest danger to our national health.

Statistics show that about fifty per cent. of the time lost in workshops and offices in this country is caused by respiratory diseases due to the pollution of the atmosphere by smoke.

More than half the three-year-olds of this country have rickets, because they are robbed of sunlight by the smoke pall.

The amount of sunlight has been found, by readings taken from various parts of England, to be in inverse proportion to the degree of air pollution.

About seven-eights of the sun's power is shut off by smoke from the centre of London, and eighty tons of poisonous soot are emitted in the capital every hour.

The remedy lies in the burning of the smokeless fuels, gas and gas coke. The atmosphere is not polluted in the slightest degree either during their manufacture or their actual combustion.

For the latest data about Smoke and Fog write to the address below

GAS brings Health

The British Commercial Gas Association, 28, Grosvenor Gardens, London, S.W.1.

SMOKE PREVENTION LTD.
COMBUSTION ENGINEERS,
1, VICTORIA STREET, LONDON, S.W.1.
TELEPHONE VICTORIA 2671.

WITHOUT SEOTOO

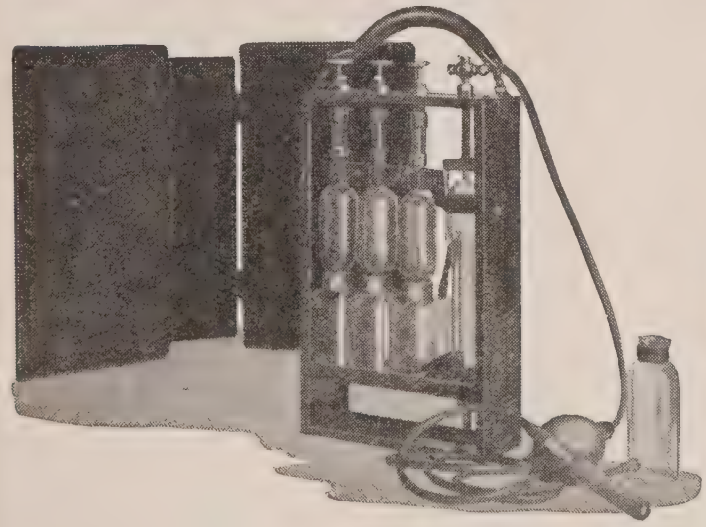
INSTALL
SEOTOO
SMOKE
PREVENTER
AND
STOP
THAT
SMOKE!

PHOTOS TAKEN WITHIN
50 SECONDS OF EACH OTHER

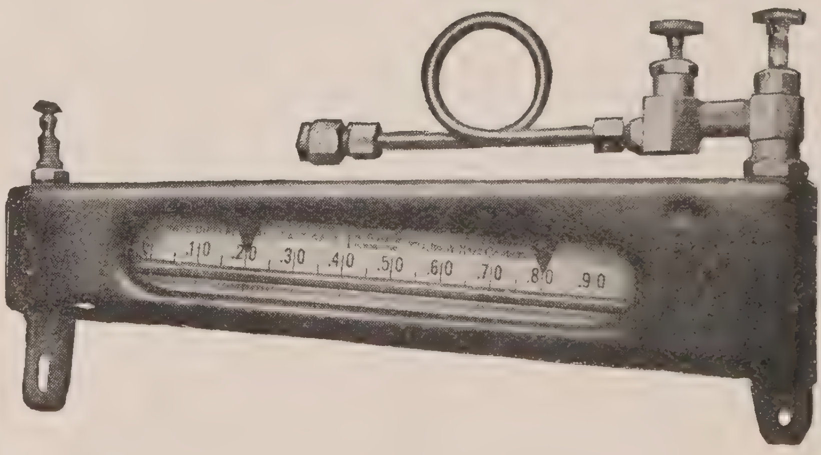
WITH SEOTOO

Two Inexpensive but indispensable Aids to Smoke Abatement & Fuel Economy

HAYS GAS ANALYSER



HAYS DIFFERENTIAL DRAUGHT GAUGE



By means of the above instruments you can determine the correct draught to use in connection with your Boilers, Furnaces or Ovens, etc.

The correct draught is the one that will completely burn the fuel (without black smoke) and produce the maximum % of CO_2 in the flue gases, without the presence of Carbon Mon-oxide.

The above instruments are so simple that they can be used by anyone whom it is safe to have about a Boiler Plant. CO_2 tests can be made at the rate of one per minute and draught readings taken in hundredths of an inch water gauge, at a glance.

Further particulars (also of **CO_2 RECORDERS**) *from the Makers :*

DUGUIDS LLD., Combustion Engineers, LYMM, Cheshire

Medical Officer of Health for Manchester. The former gave an interesting address on education in smoke prevention, but admitted that not very much could be done in the formal way of education to solve the smoke problem. In industry smoke usually meant waste and unscientific control, and, of course, modern technical training attempted to inculcate efficient and scientific methods generally. Propaganda might do a good deal to discourage the production of household smoke, but only intensive propaganda could get people to use gas and electricity instead of coal.

Dr. Clark took for his subject the work of the Manchester and District Regional Smoke Abatement Committee, which had now been working for six years. It acted in an advisory capacity only, but those who knew its work knew how steadily it was spreading its influence in the areas which it covered. In thirty-three districts round Manchester it was found that some thirty times more smoke was produced than the average for Manchester. This suggested a special problem. In a region like that which included Manchester and the surrounding townships one local authority, because of administrative or financial difficulties, might nullify the work done by its neighbours to remove the smoke nuisance. Clearly, therefore, the whole problem could be better tackled by a regional committee which had statutory powers. He suggested that there ought to be one controlling body for the whole of South-east Lancashire.

The Dean of Manchester occupied the chair, but, having to leave early, was followed by Alderman W. T. Jackson.

A Survey of the Smokeless Solid Fuels

1. ANTHRACITE.

BY H. L. PIRIE, M.C., M.I.Mech.E., F.Inst.F.

Anthracite (from the Greek, *anthrax*, coal) is nature's smokeless fuel, and is coal in its purest form. It is hard, dense and breaks with a clean, bright conchoidal fracture. Anthracite burns slowly, with an entire and absolute freedom from smoke and soot. Its ash content, arsenic, sulphur and other impurities are low, while its heating value is very high, being in the region of 15,000 British Thermal Units per lb.

Seyler classifies all coals which contain not less than 93% carbon, and not more than 8% and 3.7% volatile matter and hydrogen, respectively, as Anthracite.

Geologists are not agreed as to the origin of anthracite. There are two schools of thought: the one considers that by volcanic action the volatile matter has been driven off from bituminous coals; the other, that the difference between bituminous and anthracite coals is due to original differences in the nature and composition of the vegetable matter from which they are derived. The latter theory appears to claim more adherents, because if anthracite has been formed merely by the loss af volatile matter its ash content would have been high, whereas South Wales Anthracites are particularly low in ash, it being generally true the more anthracitic the nature of the coal, the lower the ash content.

Its sources and uses.

Anthracite is mined principally in the western part of the South Wales coalfield, and in the state of Pennsylvania, U.S.A. Inferior grades are also found in Scotland, Belgium, France and Germany, while considerable deposits exist in Russia and China. The finest anthracite in the world is that found in South Wales, where upwards of 20,000 men are employed in raising annually about five million tons. About 75% of the output is exported, largely to Canada, the United States and continental countries, while about one million tons are consumed at home. It is gratifying to think that the effect of educational propaganda is reflected in the growing popularity of the fuel as shown by statistics relating to increased inland demand.

Industrial Uses.

Anthracite is used for steam raising* where smokeless combustion is required. The restricted space of internally fired narrow flue boilers makes it extremely difficult, if not impossible, to burn soft coals smokelessly and at the same time economically at other than light loads. The solution to the industrial smoke problem depends either upon correct furnace design and operation, or upon the use of low volatile smokeless fuels.

No boiler fired with anthracite will smoke; in fact it is difficult simply by looking at the chimney to say whether anthracite fired boilers are working or not Anthracite can be successfully burned in any ordinary furnace, but high railway rates are likely to militate against its general use for steam raising purposes in towns situated in the immediate neighbourhood of other coalfields.

To render its advantages available over as wide an area as possible, the size offered for steam raising is generally known as Peas ($\frac{3}{8}$ ins by $\frac{5}{8}$ ins.) which are marketed at a price strictly competitive with steam coals, but as the intensity of the draught required is principally dependent upon the permeability of the fuel, it follows that—just as bituminous coals require certain furnace conditions to meet their peculiarities—draught requirements, grate design and stoking practice must receive special consideration in plants where the use of the smaller sizes of anthracite is contemplated.

---

* For fuller information see "Steam Raising with Anthracite.' *Engineering and Boiler House Review*, July, 1930.

Suction gas is still one of the cheapest forms of power available, and anthracite is the favourite fuel for use in gas producers of the suction or the suction/pressure type.*

Among many miscellaneous industrial uses anthracite is almost exclusively used in the malting and hopdrying industries where a fuel free from arsenic is required. For horticultural purposes where fruit and delicate blooms which are cultivated under glass, require a high, uniform and constant temperature, it is unrivalled. It is non-injurious to plant life, and as its combustion is not attended by the emission of soot, smoke or grit, dirt is not deposited on the greenhouses, which in consequence receive a maximum of sunlight.

Space forbids more than a passing mention of the use of anthracite for cement making, lime burning, electrode making, steel manufacture, powdered fuel firing, etc., but the anthracite firms are always prepared to place at the disposal of users or prospective users, the benefit of their experience in the selection and utilization of anthracite for domestic and industrial purposes.

The Selection of Anthracite.

In the selection of coal for any particular purpose the only sure guide is practical trial, but it cannot be too strongly emphasised that the size of coal is largely determined by the size of the appliance in which it is to be burned.

It has been the custom of the trade to recognise two main classes of anthracite, viz.—" Big Vein " and " Red Vein." But these descriptions are loose and unsatisfactory because each colliery has hitherto regarded its product as " best " with the result that there were a number of " best Big Veins " and " best Red Veins," all of which might behave quite differently under similar furnace conditions.

The Welsh anthracite industry has in recent years undergone a process of rationalisation and this has enabled the collieries involved to be divided into a series of well-defined groups ranged according to quality, each group consisting of collieries which produce coal of the same grade and having similar characteristics.

The advantage of this arrangement to both consumer and merchant is obvious. The former, having established by trial or otherwise the group which is best adapted to meet his requirements, will order accordingly, with the satisfaction of knowing that all supplied will be reasonably uniform in quality, while the latter, having a knowledge of the properties of the various groups, will be able to recommend with confidence a definite group for any specified purpose.

Domestic Uses.

As household fires are responsible for the major portion of the smoke pollution of the atmosphere, it is fortunate that anthracite is primarily a domestic fuel.

Too little attention has in the past been paid to the scientific heating of our homes, but progress is undoubtedly being made, and the influence of medical and sanitary authorities and this Society, is taking some effect. In this connection, in the " Daily Mail " of the 3rd April, 1929, Sir W. Arbuthnot Lane wrote :—

" There are many smokeless heating accessories to be had and the spur of an enlightened public demand would create more of them, and Britain would be purged of one of its greatest menaces (The smoke evil). One fuel I have particularly in mind is anthracite, which is not so well known as it should be. Smokeless, of high calorific value, and, in the long run, cheap, it is probably the most efficient and yet most neglected fuel which Britain produces to-day. In the late session of bursting pipes and chilly rooms the possessor of a well-placed anthracite stove is to be envied."

" The maintenance of an even temperature throughout the house, which such an installation ensures, is a point of high importance in the health of the individual. And when it is won without vitiating the air which others breathe, it is doubly to be desired."

An anthracite stove is the cheapest form of central heating obtainable. Such a stove will burn continuously hour after hour, day and night, with a minimum of attention. Using anthracite stove nuts at 70/- per ton, a room 16 feet square can be heated for less than a farthing an hour.

When in addition to its direct advantages, the indirect factors of cleanliness, convenience, comfort, reduced doctors' and plumbers' bills are taken into consideration, what little prejudice there may be against a closed stove, is soon forgotten. In Canada, America and France their use is general, and in fact, in some of the eastern cities of the United States smoke emission from domestic chimneys is prohibited.

In domestic types of hot water boilers such as the " Ideal," " Sentry," " Glow-worm," etc., anthracite keeps alight throughout the night, thus ensuring a constant supply of really hot water all the time. These boilers consume less than one cwt. of anthracite boiler nuts per week, at a cost of about 2/9 per cwt.

In certain types of open fire it is used on account of the fact that no chimney sweeping is required. A room 18 feet square can be heated for three hours for one penny. Anthracite will burn in many types of open grate, but generally speaking best results are obtained from smokeless fuels when they are burned on grates designed to meet their special requirements.

---

* For further details see "The Theory and Practice of the gasification of coal in Producers." Proceedings of the Institute of Fuel, 1931.

In ranges such as the " Kooksjoie," " Cookanheat " and " Duchess " it has no rival. Stove nuts or French nuts, for the larger sizes being recommended for this service.

In large central heating boilers anthracite has many advantages over oil and coke. The bulk weight of coke is out of all proportion to its heating value—a ton of anthracite occupying about half the volume of an equivalent weight of coke. When it is remembered that its heating value is in many cases 50% greater, it follows that three times the quantity of heat can be stored in a given space when it is filled with anthracite as against coke. This is a most important consideration in houses, flats and office buildings where the fuel storage accommodation, as so frequently is the case, is limited.

As it burns slowly it is difficult to abuse or waste even in inexperienced hands. It does not deteriorate when stored in the open over long periods. If the draught regulation be correct, clinker will not be formed.

The Preparation of the Fuel.

Before anthracite is marketed it undergoes a series of processes of breaking, screening and washing. Although costly, this is an economical advantage to the consumer, as it ensures that he will receive coal of uniform size—free from small which had to be paid for in the case of ordinary coal .

When the colliery tram comes from underground the anthracite which it contains is tipped on to a stationary screen. This takes out a certain proportion of small coal known as " Billy " coal. The partly screened Anthracite passes through a breaker and the larger sizes from this machine travel along picking belts where stones and other impurities are removed by hand. Thence the coal is loaded into trucks which carry it to the port of shipment or inland to the home consumer.

The smaller sizes of fuel which pass through the breaker cannot be efficiently picked by hand alone and are therefore washed in order to remove stones and shale. The principle of the washery is based on the fact that the coal is lighter than the shale so that the latter sinks to the bottom of the water while the coal is washed by waves produced by a plunger motion.

The coal is subsequently sized by passing it through revolving screens. The following table gives the nomenclature of the principal sizes made, together with their main uses.

Large ..	Over 4"	Malting and Hopdrying.
Cobbles	2½"—4"	Large central heating and greenhouse boilers.
French nuts	1¾"—2½"	Open fires and large kitchen ranges.
Stove nuts	1" —1¾"	Closed stoves and " Kooksjoie " type ranges.
Boiler nuts	⅝"—1⅛"	Domestic Hot water Boilers.
Beans ..	⅝"— ⅞"	Suction Gas Plants.
Peas ..	⅜"— ⅝"	Steam raising with forced draught. Chaudesse and Pithers stoves.
Grains ..	⅛"— ⅜"	Metallurgical and other purposes.
Duff ..	0"— ⅛"	Manufacture of patent fuels.

The price charged per ton for a fuel is no index of its heating value. The tonnage price of anthracite is higher than that of house coal or coke but it is cheaper because it lasts longer. In other words, its high price is much more apparent than real—it saves more than it costs. Inferior fuel is expensive in the long run ; when the tonnage price of each fuel is known, the relative values of coke and anthracite can readily be calculated, as two tons of anthracite may be regarded as equivalent to three tons of coke, hence anthracite, for example, at 59/11d. per ton is better value than coke at 40/- per ton.

The Operation of Anthracite burning Appliances.

The efficient and economical operation of domestic anthracite burning appliances depends upon :—

1. The choice of suitable sized fuel.
2. Intelligent damper regulation.
3. Correct firing and installation.

Through lack of appreciation of these factors there is a tendency, when trouble is experienced with a boiler or stove, wrongly to attribute blame to the fuel.

Anthracite stoves should be stoked twice a day, morning and evening, and the ashes removed in the morning.

Very little experience with dampers will show the correct position for them. Bearing in mind that it is necessary to admit cold air for combustion at the bottom, an opening at the top must counterbalance this inlet in order to allow waste products to escape. Therefore, if a fire is burning very briskly and it is desired to slow it down, it is necessary first of all, to reduce or close the cold air inlet at the base and reduce the damper opening in the uptake a few minutes afterwards ; otherwise, if the boiler or stove is controlled entirely by means of the damper in the uptake, there will be a temporary throttling of the waste gases and some of the products of combustion will find their way into the room. Atmospheric conditions affect the draught. In stormy weather dampers should be checked. On the other hand, during ' muggy ' weather they should be opened up.

Clinker is fused ash, and is formed by forcing the boiler much beyond its rated capacity, that is by running with the dampers full open for too long a period.

The correct method of firing a domestic hot water boiler and for giving the best results, is obtained by maintaining a bright fire four or five inches thick, and replenishing it occasionally with sufficient fuel to form a thin layer over the incandescent surface. The firepot should never be completely filled unless the boiler has to be left unattended for a long period, e.g., over a week end. Fuel sufficient to fill the firepot about half-full should be put on before retiring, and both the ash pan and chimney dampers checked. Run the poker through the bottom of the fire first thing in the morning and ast thing at night.

An anthracite fire may be lit by the following methods :—

1. Lay the fire in the same way as an ordinary fire, but see that the wood is dry and a trifle thicker than is required for soft coal, and use a little more of it. Place a good layer of anthracite over the sticks, light the paper and then leave it entirely alone. The poker must not be used.

2. On the top of some glowing embers taken from an ordinary coal fire place a layer of anthracite.

The public are undoubtedly taking an increasing interest in the avoidance of smoke, and can do much to create a sustained demand for anthracite. Where new industries are springing up and residential area are being developed, let us make sure that these areas will be developed on smoke-free lines.

¶ There must be thousands of people who are interested in the work of our organisation. Many of them would be interested in this Journal. You would be doing both them and us a favour by handing them a copy.

This Journal is the official publication of the National Smoke Abatement Society.

It chronicles the Society's activities and contains articles by our leading supporters. It's advertisement pages show the appliances and give the names of the firms who make them, which are making possible the fulfilment of our aims.

Order your regular copy at once.

CLEANER CITIES

POWELL DUFFRYN SMOKELESS STEAM COALS are unrivalled for EFFICIENCY, ECONOMY and CLEANLINESS.

There is a SMOKELESS COAL for every use :—
Power Stations, Industrial Plants, Institutions, Laundries, Steam Lorries, etc.

P.D. Smokeless Steam Coals have a very low sulphur and ash content, with a high percentage of fixed carbon.

They are eminently suitable for use in modern mechanical stokers.

BRIGHTER HOMES

PHURNOD SMOKELESS COAL is suitable for all types of domestic hot water boilers, central heating plants, slow combustion stoves, kitcheners, etc.

PHURNOD makes no soot, possesses great heat value, and is the most economical fuel obtainable at its price.

PHURNOD is obtainable in 3 sizes for various requirements :—

No. 1. Cobbles, for horticultural use and the larger central heating plants.

No. 2. Large Nuts, for the larger type of domestic hot water boilers.

No. 3. Small Nuts, for the smaller type of domestic hot water boilers, slow combustion stoves, kitcheners, etc.

For further particulars apply to :—

STEPHENSON CLARKE & ASSOCIATED COMPANIES LIMITED
4, ST. DUNSTAN'S ALLEY, LONDON, E.C. 3.
And at :—Cardiff, Southampton, Birmingham, Nottingham, Liverpool, Hull, Newcastle-on-Tyne, Glasgow, Belfast.

FOR

SMOKELESS

STEAM RAISING, CENTRAL HEATING, HOT WATER SUPPLY

BY

PRODUCER GAS FIRED BOILERS
OIL FIRED BOILERS
ELECTRO THERMAL STORAGE

and all Modern Methods consult

SAUNDERS & TAYLOR LTD.

ENGINEERS

Praed Rd. Trafford Park,
MANCHESTER.

118-122, Holborn,
LONDON, E.C. 1.

LET US ADVISE YOU ON ALL YOUR PROBLEMS OF

VENTILATING

DUST REMOVING, STEAM REMOVING, REFUSE COLLECTING, INDUCED DRAUGHT AND HEATING, Etc.

EXPERTS IN THE DESIGN, CONSTRUCTION AND APPLICATION OF FANS FOR ALL PURPOSES

▣

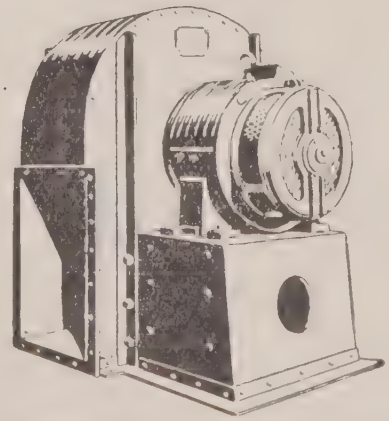
Telephone: 6024 CITY

SCHEMES AND ESTIMATES FOR COMPLETE INSTALLATIONS FREE

Efficiency Guaranteed

▣

Telegrams:
"Exhauster, Manchester."



THE "BRADSHAW" ELECTRIC EXHAUSTER

CALL WRITE OR 'PHONE

The Bradshaw Fan & Ventilating Co., Ltd.

134, DEANSGATE, MANCHESTER.

The Journal of the National Smoke Abatement Society

(The Official Quarterly Organ)

Editor : **Arnold Marsh, M.Sc.Tech.**

Editorial Office:
23, King Street
Manchester
Telephone : Central 1218

Advertisement Office:
The Service Guild
45, Deansgate Arcade, Manchester
Telephone : Central 1165

The Journal of the National Smoke Abatement Society. Vol. 2. No. 6.

CONTENTS OF SPRING ISSUE

Page
Commentary 31
The Meuse Valley Fog 33
A Statutory Committee for South East Lancashire ? 34
The Effects of Smoke Upon Buildings .. 37
A Survey of the Smokeless Solid Fuels.
II. Semi-anthracitic & Semi-bitumous Fuels 41
(*Illustrated*)
Correspondence :
Councillor W. Asbury & Mr. R. Morton Rowe 46

COMMENTARY

REFERENCES are made in several places in this number to the question of Statutory Regional Committees, and the report of the meeting held in Manchester should be of general interest. The extraordinary part of the discussion at this meeting was the lamentable lack of understanding of the facts of the smoke nuisance displayed by some of the delegates—delegates, it should be noted, who had been chosen and sent by their respective authorities to discuss a highly important suggestion for combating the nuisance in a better manner. There were some reasoned and pertinent criticisms of the proposals, which were entitled to a serious hearing, and these remarks of course, are not concerned with such. It might be argued that the other criticisms were not worth troubling about, but the point, to our minds, is that ignorance of what the smoke nuisance means is widespread among many councillors and municipal officers, and that this particular meeting was only a case typical of many.

* * * * *

The abolition of coal smoke, when it does come, will probably be largely effected through the activities of the local authorities, in the manner that much of what has already been done in certain quarters has been due to the powers possessed by these bodies. It is therefore most unfortunate that so many who, if they would, could do so much to improve the atmosphere, are so indifferent to it, and so unaware of their responsibility. There are, of course, many municipal representatives who fully realize all that appertains to smoke, and indeed the smoke abatement movement owes a great deal to them. But before local government makes full use of its present powers and presses for further authority, by means of which perhaps the greatest progress of all will be made, it is essential that the question should be considered more frequently and more seriously by those who serve upon the councils. The formation of a public opinion, well acquainted with the results of the smoke evil, is generally taken to be a necessary step on the road to smoke abatement. It is equally important and perhaps more urgent, to enlighten and enlist the many urban and borough councils where the pollution of the atmosphere has either not been noticed, or not yet regarded as one of the most important and essential parts of public health administration.

We are able to give a further account of the tragic fog in the Liége district, which shows that the fantastic and sensational theories put forward to account for it have been completely demolished, and nothing remains to be done but to confirm the highly probable supposition that the trouble was due to an abnormal concentration in the fog of the normal industrial smoke and fumes, and that the most noxious constituent was our old enemy, sulphur dioxide. The Meuse Valley has been unfortunate, but only in degree, for it has had nothing phenomenal beyond a concentrated dose of what is being received every day in greater dilution in every coal burning district. For example in a comparatively fogless November last year there were 94 deaths from respiratory diseases in Manchester, but in January, with a long period of dense fog, the deaths rose to 365. As, however, these fatalities did not occur with the sensational suddenness which marked those in the Liége district the fact was barely noticed in the Press, which devoted much space to the Belgian tragedy. A century-old familiarity has bred a callous and felonious contempt.

* * * * *

Some readers may have seen the correspondence which has been proceeding in the Architect's Journal on smoke prevention, between the Secretaries of the Coal Merchants' Federation of Great Britain and the National Smoke Abatement Society, the main points at issue being the culpability of the domestic coal fire and its comparison with smokeless fuels. While the Federation has naturally a tender regard for raw coal as a domestic fuel, it is pleasing to find that the smoke nuisance is recognised and that there is a real, if somewhat indeterminate, conception of the smokeless ideal. We hope that the Federation may be able gradually to bring this before its members, for there is little doubt that many coal retailers look upon smoke abatement with a certain disfavour, and are not precisely eager to sell prepared fuels in place of raw coal. In fact many who are interested in the coal trade are ready to take up the cudgels in favour of raw coal, as Mr. R. A. Burrows rather suprisingly did in a recent paper. We venture to suggest that this attitude is a little short-sighted, and that, actually, it is to the interest of the coal merchants to encourage and help to popularize solid smokeless fuels. The near future will, without doubt, see a further great increase in the use of electricity and gas, with a further reduction in the solid fuel used, and an increase also—faster or slower—in the use of solid smokeless fuels, from high, low, or both high and low temperature carbonization. This change, which is already taking place, is going to affect the coal retailer considerably unless he becomes the distributor of these fuels. If, however, he alienates himself from this movement, which we believe is inevitable, even though gradual, the distribution will largely be carried out by the gas undertakings or by other organizations connected with the fuel manufacturers.

* * * * *

An interesting little booklet has just come to hand, which we would like every coal merchant to see. It is entitled " Smoke Control " and is published by the Metropolitan Coal Company of Boston, U.S.A. The Company is " the largest retail distributor of the highest grades of both anthracite and bituminous coal in New England " and is " anxious to have you call upon their Engineering Service Department to assist you in solving your fuel problems. There is no charge for the service." The pamphlet contains all particulars of the Massachusetts law on smoke prevention, an article by the Deputy Smoke Inspector interpreting the law, and notes on the proper firing of furnaces either by hand or stoker feed. This is a notable instance of the coal merchant allying himself with and assisting clean air, and we would like to see similar productions distributed in this country. Some day, perhaps, we shall.

* * * * *

The " Times " recently printed an article entitled " The Beauty of Smoke." Commencing by saying that " smoke in its modern developments has become a portentous nuisance, a Python against whose coils the legislative Phoebus shoots his puny shafts in vain," it was made clear that the writer was holding no brief for coal smoke, but wished only to recall the fragrant reek of smoke from wood and peat ; the grace of " the volutes of rolling smoke," with its " eddings, foldings and swimmings " ; and the " little plume which marks the wood-fire of the cottage hearth or the gypsy camp-fire on the road-side waste." A charming gentle essay indeed, in which not even the most agressive smoke abater could find offence. Judge therefore our surprise, to read in " Municipal Engineering," in the column headed " The Public Health Department," a comment on this as follows : " How I laughed as I read ; contemplating the fury the words of praise must arouse in the hearts of those whose task is its condemnation and who must dread the effect of any word that is on lines other than those laid down in their schemes of propaganda." The grave charge that seems to be laid indirectly against us here is that we, in our demand for clean air, have lost our sense of humour. This we deny, realizing that the ability to laugh, at ourselves as well as others, is a most valuable ally, without which our campaign would be a dreary and lengthier task. As proof that we do see the humour in things we will print, without any comment, some further reflections from this column, presumably written, it should be noted, by a M.O.H. :—" This trick of blaming smoke for all the sunlessness and horror of our winter months seems ridiculous . . .that there will ever come a time when existence here without smoke making is possible, I cannot believe. Far better, therefore, let us accept it as inevitable and regarding it as a producer of artistic effects advertise it not as one of the more objectionable of our possessions, but actually as one of our attractions that tourists on no account should miss."

The Meuse Valley Fog

A FURTHER REPORT

Following Alderman Melland's article in the last issue of the Journal, we are able to print an article from the Liége " Express " which deals with the work and methods of the Commission of Inquiry set up to investigate the disaster. The following is a translation of this article :—

A plenary meeting of the Commission of Experts instituted by the Queen during her visit to the afflicted region, and completed by the Public Prosecutor of Liége, has been held during the last few days, and the members have communicated to M. Lefebvre, who is in charge of the investigation of this sad affair, the first results of the progress of their work, which has been, as may well be undertsood, very difficult. The conclusions which have actually been arrived at by the investigators can be given.

The Post-Mortems.

Doctors Firket and Bovy, who have carried out these sad examinations have determined " with every victim " an irritation of the respiratory passages. It is " cardiac collapse " which has led to these fatal results, the heart failing, as is often the case with pneumonia and after operations. M. Rubay, director of the Veterinary School of Cureghem, has arrived at the same conclusions with respect to the animals. And, in addition, the inquiry made in the district from which the sufferers came—it is hardly necessary to say this in passing— has confirmed the fact of the post-mortems.

Professor Schoofs has been in charge of the examination. Up to the present he has not isolated the irritant substance, and his analyses are far from being completed. It is a question of long and detailed work. In short, for each new substance the presence of which it is attempted to reveal, it is necessary to recommence the examination from end to end, using new reagents, observing their reactions, and employing different methods for each test.

A Point Determined.

Is the presence of an irritant " body " in the fog, a body the nature of which has yet to be determined. The experts have purposely used the word body, for in the present state of their work they are not yet able to say whether they are in the presence of a solid or a gas. Nevertheless sulphur dioxide can produce disorders similar to those observed. And our readers will remember the letter which was addressed to us at the time of the tragedy by one of our readers, who furnished some very competent explanations in propounding this hypothesis. It appears, at the moment, that this theory will be amply confirmed by the attempted researches.

It is necessary to note, however, that all combustion of coal, even in a stove, obviously emits the aforesaid gas in more or less large volumes. In the actual statement of the work of the commission there is nothing whatever to give rise to the belief that there had been the " abnormal " emission of a poisonous gas. This destroys completely the stories and legends of aeroplanes, of asphyxiating gasses, and of accidents at factories, which have been freely circulated, and which have contributed not a little to the consternation of a people already sorely tried.

The Special Meteorological Circumstances.

One of the most interesting points raised at this plenary meeting was brought forward by M. Dehalu, director of the Cointe Observatory. It has been verified that very unique meteorological conditions contributed to the formation of a dense fog during the days of December 1st, 2nd, 3rd and 4th. The nights were cold, and the wind blew—if one can say so much—in the direction E.S.E. (from Liége towards Huy) and was particularly slight—a kilometre an hour. During the above mentioned time all the smoke from Liége basin, instead of being swept away as usual was concentrated in the fog. From day to day its concentration increased.

Following this it can be noted that the deaths occured for the most part from the third day, and the region between Jemeppe and Engis, on both banks of the Meuse, was afflicted. After Engis, towards Huy, the occurences became rarer and less serious. One may be permitted to suppose that if the fog had lasted only two days and not four there would perhaps have been no deaths to deplore. It should be noted that the valley is particularly narrow at Engis.

Similar meteorological conditions may evidently be reproduced in the future, but there is no doubt that they are exceptional, as, for example, the great floods which have ravaged Liége for centuries. Yet there is no reason for panic when these transient fogs occour. It can be mentioned that there have been several recurrences since the catastrophe, and that there have been no victims nor any distressing consequences. Those of the beginning of December were due to the abnormal duration of the fog, and thus to the extraordinary concentration of smoke and fumes which are particularly injurious.

The study of Smoke in the Valley.

Professor Batta and Colonel Mage have undertaken a general investigation of the smoke in the valley. Needless to say they are finding this a delicate matter, and the work arduous, long and minute. These gentlemen have already visited a large number of industrial establishments in the region where Professor Schoofs has been engaged in taking samples of air from different points in the valley. But, it will be appreciated, the conclusions from these various researches have not yet been formulated.

Artifical Fogs.

Laboratory experiments will shortly take place. In effect, the experts will produce artifical fogs under glass bell-jars. Different substances and poisonous gasses, particularly sulphur dioxide, will be introduced into these fogs and guinea pigs will be submitted to their effects. The animals will undergo a post-mortem in their turn, to compare the results obtained with those that have been noted up to the present.

It is hoped that it will be possible to carry out an experiment of the very widest scope. On December 23rd the wind had the same velocity of one kilometre an hour and the fog seemed bound to reach an intensity as great as when it made its terrible appearance. However, it ceased pretty rapidly and caused no ill-effects.

It can be seen that the Commission has already completed a large part of its work. The Public Prosecutor, M. Lefebvre and the experts are of the opinion that the public can be regularly informed of the work and experiments by which will be determined the causes of the trouble and the methods of remedy.

We may again state that the most efficacious means of protection against the noxious effects of fog is to cover the mouth with a simple scarf which will prevent the particles from infiltering into the body.

G. VERCKEN.

A Statutory Committee for South-East Lancashire

The Manchester and District Regional Smoke Abatement Committee, comprising authorities in a fifteen mile radius of Manchester, has been considering the possibility of the formation of a Statutory Committee for the area, and a meeting of representatives from the various authorities was held in the Manchester Town Hall, on February 19th to discuss the question. The following report of this meeting is given at length because it is felt that the discussion which took place is likely to be of general interest to all readers, especially as it shows, to a marked degree, the various points of view from which smoke abatement legislation is considered, and the attitudes of those who are opposed to such measures.

The meeting, attended by over a hundred delegates, was opened by the Lord Mayor, and was presided over by Councillor Cunliffe of Farnworth.

The Lord Mayor pointed out that the present Committee had no statutory powers, but if they could set up a Statutory Committee they would be able to deal with the smoke nuisance in the area in a unified and scientific manner. This method had the support of municipal legal advisers and of the Minister of Health himself.

The Reasons for a Committee.

Alderman Jackson, of Manchester, then spoke, and moved a resolution approving in principle the establishment of a joint statutory body. Mentioning that smoke knew no boundaries, he put forward these main reasons why the nuisance could be dealt with most effectively by a single statutory committee. The first was that at present there was no such thing as uniformity, either in the qualifications demanded of smoke inspectors or in the legal proceedings taken against manufacturers who persistently offended. In the second place the scheme would provide for fully-qualified inspectors with technical, mechanical and legal knowledge. Thirdly, the statutory committee would take the administration away from the local influences. "These influences still exist in some localities" said Mr. Jackson. "There were two magistrates at one time on the Manchester bench who were always present when smoke cases were to be heard, and very rarely on any other occasion."

The area covered by the existing Regional Committee contained three million inhabitants, and its rateable value was £20,000,000. In it there were 5,000 factory chimneys. It was suggested a year or two ago that this area should be divided into twenty inspectorial districts

W-D

Our Ideal
"A Smokeless City"

The
WOODALL-DUCKHAM COMPANY
are
manufacturers of
Continuous Vertical Retorts
Intermittent Vertical Chambers
and
Other Plants
for
Conserving Coal
and
Providing Smokeless Fuels

Head Office:-
ALLINGTON HOUSE 136-150 Victoria St., LONDON, S.W.1

District Offices:-
MANCHESTER 78 King St.,
GLASGOW 82 Gordon St.,
SHEFFIELD 22 High St.,

THE WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO., (1920) LTD.

Spring Cleanliness Every Day

Electricity Ensures Clean Air Everywhere

In your attack on dust and dirt every day your best aid is an Electric Suction Cleaner.

The Electric way of cleaning, collects dirt and allows it to be destroyed without danger to health or scattering the dust everywhere.

It is important in a house where there are children that the floor should be free from germ-carrying dust.

Use Electricity for Lighting, Heating, Cooking and Domestic Help

Send for a free copy of "The House you Want"
issued by
THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.
15, Savoy Street, London, W.C.2.

under a joint committee like that at present proposed. The scheme was turned down by local authorities too jealous of their own powers of administrations. The cost of the scheme was estimated at £10,000 for fifteen inspectors, which would amount to one-tenth of 1d. on the rateable value of the whole area.

Some Remarkable Figures.

To illustrate the difference in the present state of smoke prevention in the area—which is largely consequent upon the way the law is administered—it was stated that 536 half-hour observations had been made in Manchester and the same number in 33 neighbouring districts. The average period of black smoke emission in Manchester was 1.8 minutes and in the outside areas 9 minutes. Emissions under two minutes accounted for 71% of the Manchester cases, and only 3.7% of those outside. Further, 1.8% of the Manchester emissions were over ten minutes duration, but in the 33 surrounding districts 34.7% were above this period.

The resolution was seconded by the Rev. John Wilcockson, of Farnworth.

The Discussion.

In discussion, Dr. Joseph, M.O.H. for Warrington, said that the chief difficulty would be in the idea that the Committee, composed of cranks and faddists, was out to harass manufacturers. He stressed the necessity of having inspectors with expert knowledge. He wished to know whether the local authorities would be able to deal with prosecutions initiated by the Statutory Committee.

A Ramsbottom representative stated that the movement was to attack industrial smoke only, whereas domestic was the greater evil. Because of this it appeared that he therefore regarded the idea as useless. The same reasoning was also put forward by the Town Clerk of Salford.

A Whitefield delegate seemed to believe that because soot could be used as a fertiliser, smoke was a beneficial product, and there was no need to trouble about it.

Another delegate said he thought what Lancashire was suffering from at the moment was not too much smoke, but too little. He did not think the present time was suitable for putting additional expenditures on the taxpayers.

The difficulty put forward by a representative from, we believe, Bacup, was that this town had less chimneys in proportion to its rateable value than had certain other towns, and that their contribution per chimney would therefore be greater than would be the case elsewhere.

A Stretford delegate said that this Council would prefer to see the committee continue in an advisory capacity only, without any statutory powers.

Fifty-five Years of Failure.

Dr. Bennett (Warrington) and Councillor Duguid (Lymm) spoke strongly in favour of the resolution, and Dr. Veitch Clark (Manchester) concluded the discussion by saying that it was fifty-five years since the Public Health Acts were passed, and still the smoke problem was with us. The local authorities had failed : Lancashire was still smoke-bound, and yet they asked for another chance. It was not a question that could be settled satisfactorily except by co-operation under a statutory authority.

After making sure that the vote expressed only the individual opinions of the delegates the resolution was passed by 96 votes to 24. A further resolution was passed instructing the Executive Committee to draw up a detailed scheme to be submitted to the various local authorities.

NOTE.—This meeting is dealt with in our "Commentary."

The Effects of Smoke upon Buildings

An Interview with Sir Frank Baines.

Sir Frank Baines, who, as late Director of Works to H.M. Office of Works and Public Buildings, has had unique opportunities for studying the effects of atmospheric action upon the stonework, etc., of the buildings in his care, gave evidence on this matter at the recent inquiry held by the Electricity Commissioners on the application to erect a new building station at Fulham. Sir Frank gave some very interesting and valuable figures and information and with the view of obtaining a more comprehensive account of this important aspect of the smoke nuisance, he was approached on behalf of this Journal.

"There is to-day," said Sir Frank, "distinct evidence of a progressively increasing and rapid attack on buildings, which must be due to the higher degree of atmospheric pollution over the Metropolis. The worst effects arise from the carbonaceous or sooty matter directly arising from smoke ; from the tarry matter which gives a glue like quality to the deposited impurities on buildings ; and, most destructive of all, from the sulphur arising from the combustion of coal thrown into the atmosphere as dioxides and trioxides of sulphur."

Asked about the financial aspect of this destruction, which had been mentioned at the inquiry, Sir Frank said that it had never been dealt with fully from all sides, owing, doubtless, to the difficulty of estimation. "The general loss, however, can readily be shown to be immense. For example, in respect to the building of the Houses of Parilament, the cost of repair due to the failure of stonework alone, as a result of the attack of atmospheric acids, is, at a reasonable estimate, placed in the region of one million pounds, quite apart from the expenditure which has been incurred from time to time during the last sixty years ; here the atmospheric acid attack on the stonework of the building was manifest even before its completion."

" I estimate that in the last quarter of a century, Government buildings, on a conservative basis of estimation, have called for an excess expenditure of two and a half to three million pounds, for work renewal, renovation, repair and maintenance, directly consequent upon the increasing and concentrated pollution of our atmosphere. If a reasonably pure atmosphere had been obtained, free from the worst forms of pollution, arising from the uncontrolled burning of raw coal, this expenditure would not have been incurred, and many of our noblest historic buildings would have been retained largely in the original uncontaminated beauty.

" To apply such figures to the Metropolis alone over the whole area of its buildings, would advance the comparable and proportionate financial loss to a huge figure, while for the whole of our industrial country, a relative figure of national loss must be almost an astronomical one. Sir Josiah Stamp, in his recent estimate of national wealth, placed the national value of real property in buildings for the year 1928 at £4,500,000,000 plus £900,000,000 as the value of Government and local property, giving a total of £5,400,000,000 for the whole of the country.

" If the *very conservative* estimate of excess costs due to the necessary repair and upkeep of buildings as a result of atmospheric pollution, is applied to these figures of buildings values, we get the huge figure of an extra cost to the nation as a whole of fifty-five to sixty million pounds sterling, during the last quarter of a century ; a wasteful charge resulting solely from atmospheric impurity and the corroding effect of sulphur acids, etc.

" This estimate of the charge upon the nation due to atmospheric impurity, is most conservative, and is certainly on the low, rather than the high side ; and if an extended and careful survey could be made to arrive at true figures over a definite period of time, I am of the opinion that the figure would be likely to be much in excess of this.

" In spite of these considerations which in their general character, must be known not only to Governments, but to Industry, Commerce, and property owners generally, it appears that although attention has been drawn with almost tireless iteration to the alleged prohibitive costs of methods of an efficient and complete remedial character for the elimination of the deleterious products arising from the uncontrolled combustion of raw coal, little or no attention has been directed to the vast charges falling upon the nation as a whole, as a result of the amazing public and official apathy on this question. Now that individual citizens are beginning to take thought as to what is their remedy in preventing damage and loss, due to the continuation and increase of this intolerable nuisance of atmospheric impurity, by issue of injunction and by legal processes generally, it is hoped that Parliament will use its over-riding power to impose a remedy for this increasing disease of modern industrial life, whenever appropriate opportunity presents itself.

"Asked about the actual action of the atmospheric impurities on the stonework Sir Frank said that it was not generally believed that the effects, which are so horribly apparent in urban centres, could also be seen in varying degrees in rural and country districts, generally presumed to enjoy that increasingly rare benefit of pure and uncontaminated air.

" As examples," he pointed out, " many of the Yorkshire Abbeys and also historic buildings in the Wye valley, far removed from the industrial centres of the Midlands and the concentrated industry of South Wales, yet show increasing signs of stone decay, primarily due to the corroding presence of atmospheric acid. It is becoming increasingly evident that comparatively small proportions of the sulphur acids derived from the combustion of raw coal will, in time, cause complete destruction of the surfaces of historic buildings, far removed from centres of industry. In certain instances stone can be found still retaining the marks of the tool of the 13 century craftsman, and yet so rotted and decayed in its structure, by the action of atmospheric acid, that large pieces can be broken off with the fingers without any tool. In such cases the sulphur acids have penetrated the capillary pores of the stone and definitely turned the cementing material (which in this case was calcite) from crystalline and insoluble calcium carbonate to an amorphous and soluble calcium sulphate. The stonework, therefore, is found to be almost like shortcake."

" Look at the deplorable effects upon one of the most important building stones," he continued, "—Portland stone. This has been the principal building stone of London since the 17th century (its use is now extended to all towns in England) and its main ingredient is crystalline calcium carbonate. So rapid is the attack upon such stones in this country, that buildings erected in 1912 show a surface decay in the very best selected Portland stone of over one-eighth of an inch in fourteen years, while buildings erected in London of the very best selected Portland stone show the presence of decay in two years. If the rate of decay now being manifested in London had taken place consistently upon all buildings constructed of Portland stone since the beginning of the 17th century, it is obvious that there would have been little, if anything left of the original structures and their architect-

Kempton's

COKE FIRES

Smokeless
Labour-Saving
Economical
Attractive.

Write or Telephone to :-

C. H. Kempton & Co. Ltd.

72, BENNERLEY ROAD,
S.W. 11
BATTERSEA 4991

Head Office :-
STANGATE HOUSE,
WESTMINSTER BRIDGE RD.,
S.E. 1.

FOR CLEAN AIR AND
MAXIMUM SUNLIGHT

USE THE SMOKELESS COAL
NATURE HAS HERSELF PROVIDED

ANTHRACITE

ABSOLUTELY SMOKELESS
HIGHEST IN CARBON, LOWEST IN ASH
VERY SLOW BURNING
SAFE, CLEAN AND ECONOMICAL IN USE
MINIMUM ATTENTION—IT NEVER GOES OUT

THE BEST FUEL FOR—
DOMESTIC HOT WATER BOILERS
CENTRAL HEATING
OFFICE, WAREHOUSE, GREENHOUSE AND GARAGE HEATING

ENQUIRIES AND DESCRIPTIVE LEAFLETS :—

AMALGAMATED ANTHRACITE COLLIERIES LTD.
120, FENCHURCH STREET,
LONDON, E.C. 3.

ural detail. The rate of decay within recent years is clearly progressively rapid, unquestionably due to the increasing impurity of the London atmosphere. This decay is manifested not only as regards Portland stone but York stone ; Bath stone similarly ; Portland cement ; the external painting of walls and buildings ; the best Westmorland slates ; Red Mansfield stone ; granite ; cement rendering on walls ; Kentish Rag stone ; Oxfordshire stone, where the decay is occuring as far off the centre of London as Windsor Castle ; Caen stone ; Sand stones generally ; Gatton stone ; Anstone, of which the Houses of Parliament are built ; and all the magnesium limestones, local stones in positions as far apart as the Valley of the Wye, rural Yorkshire, Tynemouth Priory, and the rural situations in South Scotland ; Hampton Court ; and even the *interior* stonework of Westminster Hall—all of which are found to suffer as a result of atmospheric acid.

" The action between the stone and the sulphuric acid is that the acid, brought into contact with the stone, either by moisture or in the tarry sooty deposits, chemically reacts with the calcium carbonate (or, in the case of the magnesium limestones, part of the magnesium carbonate), and changes it to calcium or magnesium sulphate, with a dispersal of carbon dioxide. As a result of this reaction the newly formed sulphates—which are vastly more soluble than the natural crystalline or magnesium carbonate of the stone—are washed away by which are vastly more soluble than the natural crystalline calcium or magnesium carbonate of the stone—are washed away by rain. In addition to the chemical action there is the purely physical effect of destruction of the stone surfaces, caused by the crystallization of the sulphates ; for when part of the calcium or magnesium carbonate is formed into and replaced by calcium or magnesium sulphate, the increase in volume is as from 1 to 1.7 in the first case, and as 1 to 4.2 in the second. This relatively enormous increase in volume acts like a wedge in joints or cleavages of the stone, and in the capillary pores of the material, bursting and splitting the surface in a manner similar to, but in excess of, that of the action of frost."

A Survey of the Smokeless Solid Fuels

II. SEMI-ANTHRACITIC AND SEMI-BITUMINOUS FUELS.

The causes of smoke production are too well known to be commented on at length herein, beyond that the volatile content of a fuel is practically a direct indication of its potential smoke producing properties : that is, the higher the volatile content, the greater the possibliity of smoke production.

Complete immunity from smoke can be secured by the utilisation of low volatile fuels, and the excellent results obtained in this direction by the use of anthracite are generally conceded. A considerable percentage of the total smoke emission originates in the ordinary domestic fire, which appears to be singularly free from legislative control, so that from a combustion point of view, the quantity of anthracite now utilised for domestic purposes is undoubtedly a big factor in reducing smoke emission. Similarly, the various bye-product fuels, such as coke, have contributed their quota towards the reduction of smoke emission.

It must, however, be acknowledged that these fuels have distinct limitations, particularly in their application to steam raising. They require preferential treatment or special conditions, and in many cases additions to boiler plants, if their full heating value in addition to smokeless combustion is to be realised. For industrial purposes they cannot be burnt at a sufficiently high rate to maintain the rated output of a boiler, without the assistance of special draught and furnace arrangements, and are often difficult to light up. In addition, bye-product fuels usually contain an objectionable quantity of moisture and ash. In brief, these fuels lack the flexibility and straightforwardness which appeals to the average consumer.

The next group of fuels in order of volatile contents are the Welsh semi-anthracitic coals which, in addition to their smokeless qualities, possess several characteristics not found in slightly lower volatile fuels. A representative analysis of this group is as follows :—

Volatile Matter :	11.25%
Fixed Carbon :	82.63%
Moisture :	1.21%
Ash :	4.91%
Sulphur :	.81%
Calorific value	14,636B.T.U.

The chief characteristics of these fuels are briefly as follows :—

Smokelessness : These fuels have long enjoyed a reputation for smokeless burning, even when burnt under conditions which are provocative of smoke emission. The volatile content is well balanced and sufficient to promote prompt and easy ignition, and if required, a high rate of combustion.

Fixed Carbon : The nature of the carbon or coke residue remaining after the volatiles are driven off is of great importance in steam raising. If the residue is in the form of a dense and close coke, it is difficult to burn at high rates. Alternatively, a residue in the form of a very friable coke is also objectionable, as it tends to break up in the fire and obstruct the flow of air. One of the most favourable characteristics of this group of Welsh coals is the behaviour of the carbon content. During the early stages of combustion, the fuel opens out, or "cauliflowers," and so presents a greatly increased area of fuel to the incoming air. This gives the fuel a remarkable flexibility due to the porous nature of the fuel bed, and, by suitable adjustment of the air supply, combustion can be regulated at the desired rate. This "opening-out" characteristic is responsible for the extremely high furnace temperatures obtained with these fuels, and in addition the volatiles driven off are effectively burnt.

Ash : Apart from the low ash content, most of the fuels in this group produce a high fusion point ash, and consequently give immunity from fused clinker.

Sulphur : This constituent is undesirable on many grounds, both as regards smoke emission and damage to furnaces and boilers. As it is present in some fuels to the extent of over 2%, the slight percentage found in Welsh coals is in their favour. Moreover the damage caused to buildings by the emission of smoke, and particularly sulphurous fumes, cannot be over-emphasized, and this is best illustrated by reference to the photographs which appear at the end of this article.

Calorific Value : As will be noted in the analysis, the heating value of these fuels is very high and, what is of equal importance, the heat units are realisable, that is a greater percentage of the heat units can be usefully utilised, due to the minimised losses, such as carbon loss to ashpit, unburnt gas losses to chimney, evaporation of moisture etc.,

A prominent authority on Fuel states in a description of the Welsh semi-anthracitic fuels, "It can truly be said that such coal is Nature's finished coal product. It is a true coal in every sense of the word." It is further interesting to note that manufactured fuels, such as are obtained by carbonising processes, are "built" on the general lines of these fuels, an acknowledgement of their well balanced make-up.

Application to Steam Raising.

Large Welsh coal of 10-13% volatile is particularly suited for steam raising in boilers of the locomotive and marine type, and also Lancashire and shell type boilers. The restricted combustion spaces, comparatively cold heating surfaces, and absence of brickwork in these types of boilers are all factors towards smoke production. For this class of firing, Welsh coal has long enjoyed a reputation both for smokelessness and high steaming rates. Its performance under these conditions is taken as a universal standard, by which all other fuels are judged Fuel of this class is also marketed in washed and sized grades from cobble to duff size, and are used for steam raising where a sized fuel is preferred to large coal.

Steam Transport. Certain grades of this group are particularly suitable for steam traction work, and are the standard fuel for any makes of steam wagons and tractors. The combination of smokelessness, high heating value and other characteristics make them eminently suitable for this purpose.

Domestic uses. A more recent development has been the preparation of certain qualities of the lower volatile Welsh coals for use in domestic stoves and central heating boilers. These fuels are supplied in washed and sized grades from cobbles to bean size under branded names. In addition to being smokeless, they exhibit all the characteristics necessary for this class of work, such as : slow combustion when necessary, minimum attention, and a low ash content. Recently a series of tests were carried out on a small water boiler of the domestic type with fuel of this class and other fuels of a low volatile character, generally accepted as being the only class of fuel suitable for this purpose. The boiler was equipped with the necessary apparatus for determining the heat transference and losses, so that a complete heat balance could be obtained. The result of these tests showed that, not only was the fuel smokeless, but that it gave much higher efficiencies at a lower cost than all other lower volatile fuels.

Smokeless Coals for Locomotives and Modern Machine Firing Methods.

Taking a further step towards the higher volatile fuels ranging from 12% to 16% of which the following is a typical analysis :

Volatile Matter	16.83%
Fixed Carbon :	76.75%
Moisture :	1.03%
Ash :	5.38%
Sulphur :	.91%
Calorific Value	14,555B.T.U.

The fuels of this group are smokeless, unless grossly mishandled, and are slightly more freeburning than the lower volatile group. In locomotive practice they are quite smokeless, and for other steam raising purpose under hand fired conditions do not produce smoke, unless badly handled in an inefficient plant. The washed and sized grades of these coals are particularly adapted for modern machine firing methods, and under such conditions are not only smokeless, but will not smoke under extraordinary circumstances. An interesting demonstration of this feature was witnessed in one of the larger London Power Stations, where smoke emission is regarded very unfavourably by the local authorities. The position was so acute that a lookout is kept by the Station Staff to notify the boiler house Staff of smoke emission from any of the chimney stacks. As the fuel used is a high volatile one, and the load on the Station fluctuates considerably, notifications of smoke were frequent. A trial of washed duff of 16% volatile was made and, in addition to meeting all steam demands

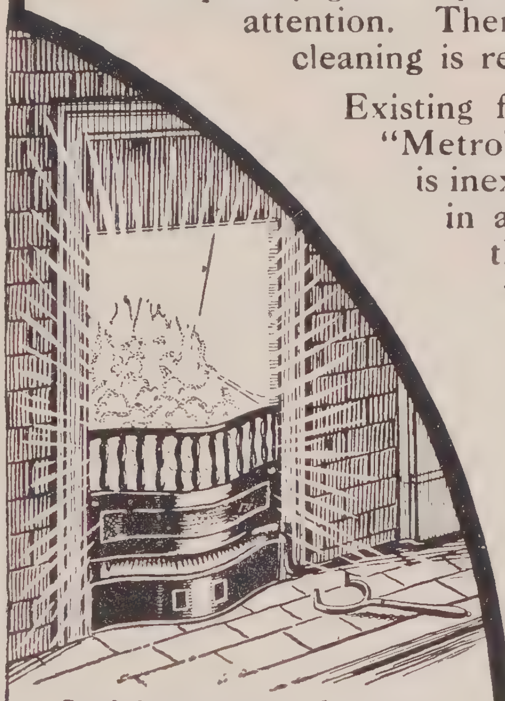
Wipe Away the Greyness;

Let Health-Giving Sunlight Into Your Homes.

Every "Metro" coke fire in use helps to reduce the smoke pall which brings disease in its train.

"Metro" coke fires burn clean, inexpensive fuel. They are quickly ignited by a gas burner and burn brightly without attention. There is no smoke, consequently room cleaning is reduced.

Existing fireplaces are easily altered to take "Metro" coke-burning grates. The alteration is inexpensive. "Metro" grates are made in attractive designs costing from 20/-; the saving in labour and fuel soon repays the cost. Apply to your local Gas Undertaking or Ironmonger, or write for a free illustrated list to


Smokeless "Metro" Coke Fire

SIDNEY FLAVEL
&CO. Ltd. STOVEMAKERS SINCE THE REIGN *of* KING GEORGE III
LEAMINGTON

Wipe out that smoke!

"BENNIS" STOKERS

ensure

ABSOLUTELY SMOKELESS COMBUSTION

combined with

HIGHEST EFFICIENCY AND

LOWEST WORKING COSTS

from

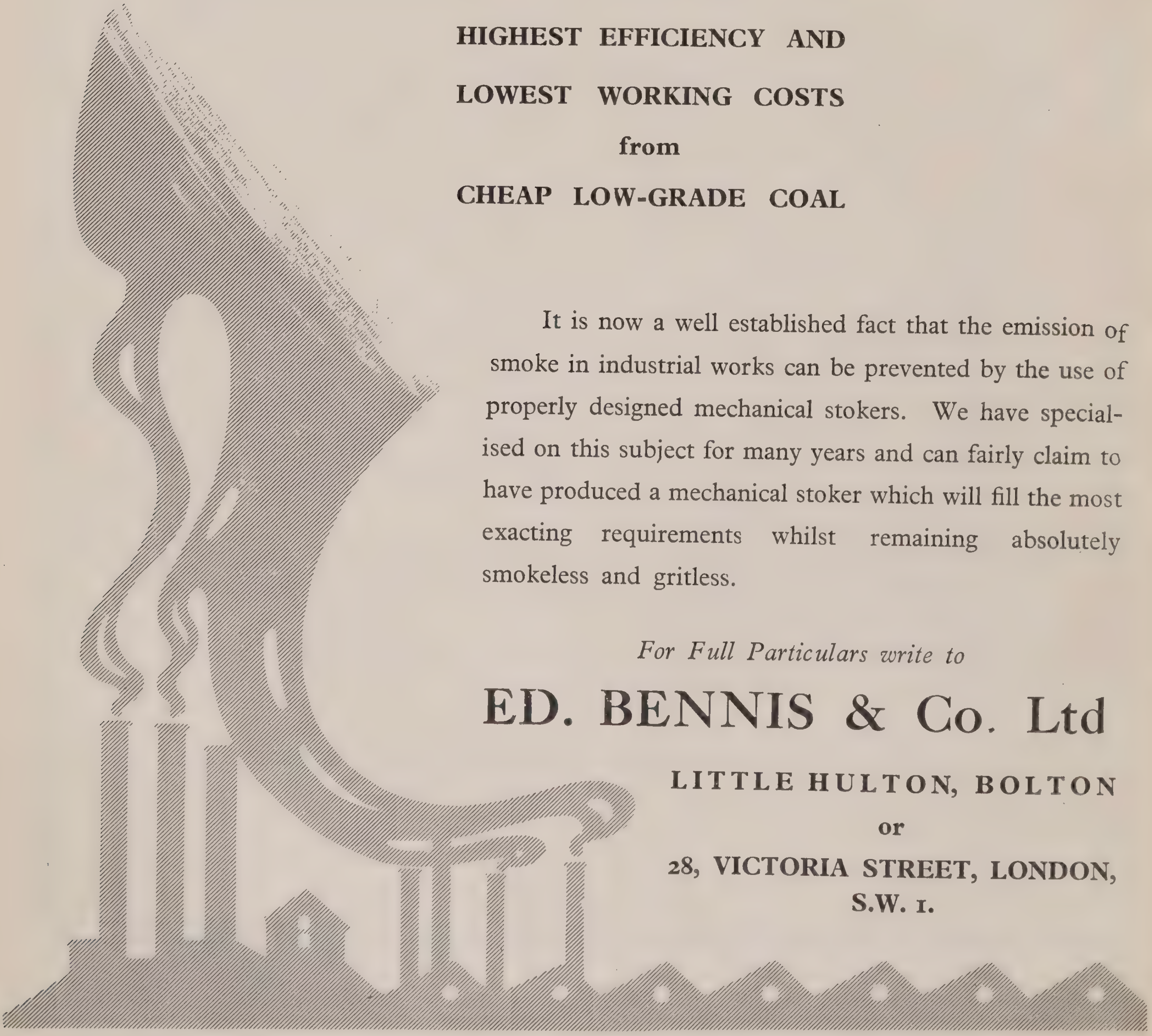
CHEAP LOW-GRADE COAL

It is now a well established fact that the emission of smoke in industrial works can be prevented by the use of properly designed mechanical stokers. We have specialised on this subject for many years and can fairly claim to have produced a mechanical stoker which will fill the most exacting requirements whilst remaining absolutely smokeless and gritless.

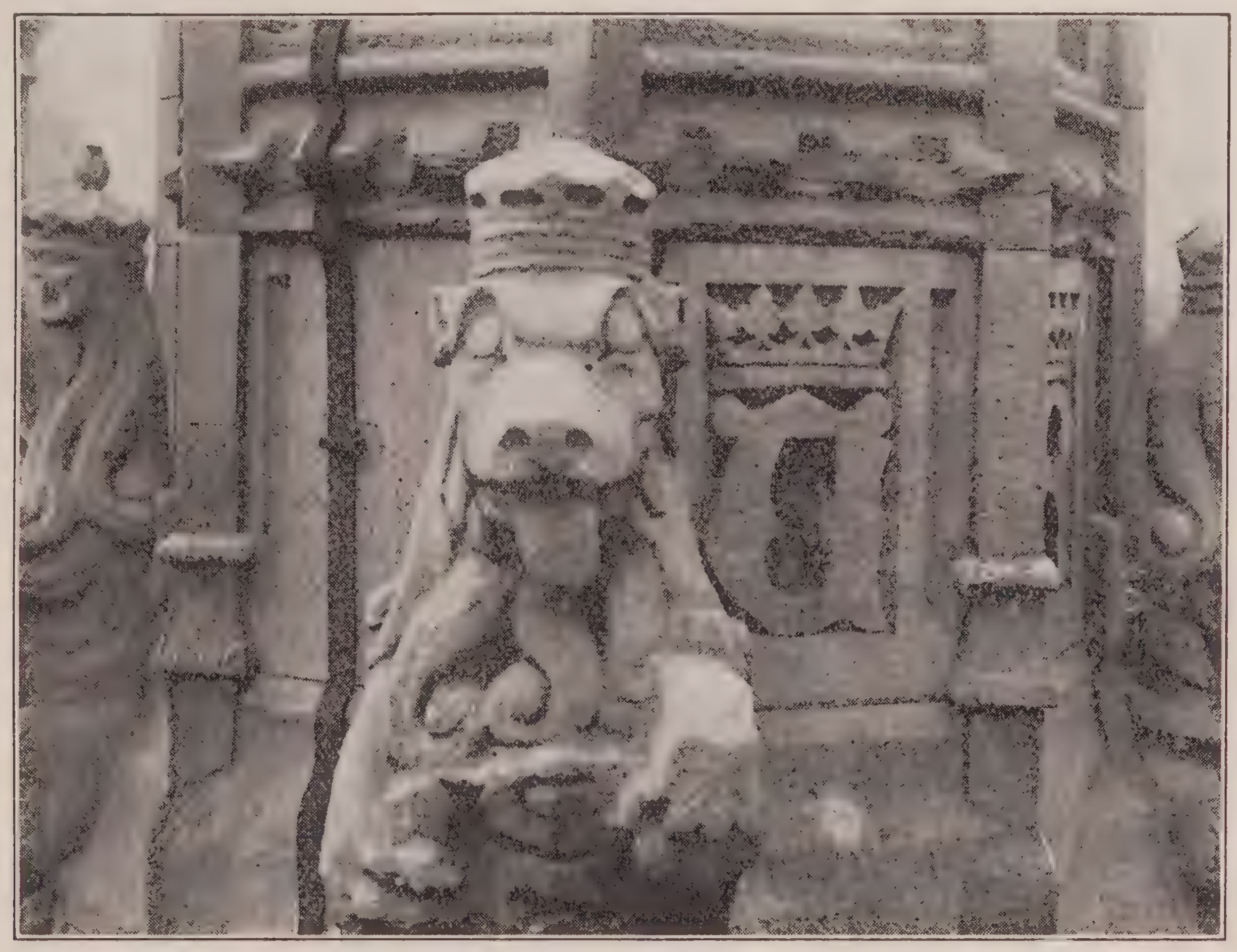
For Full Particulars write to

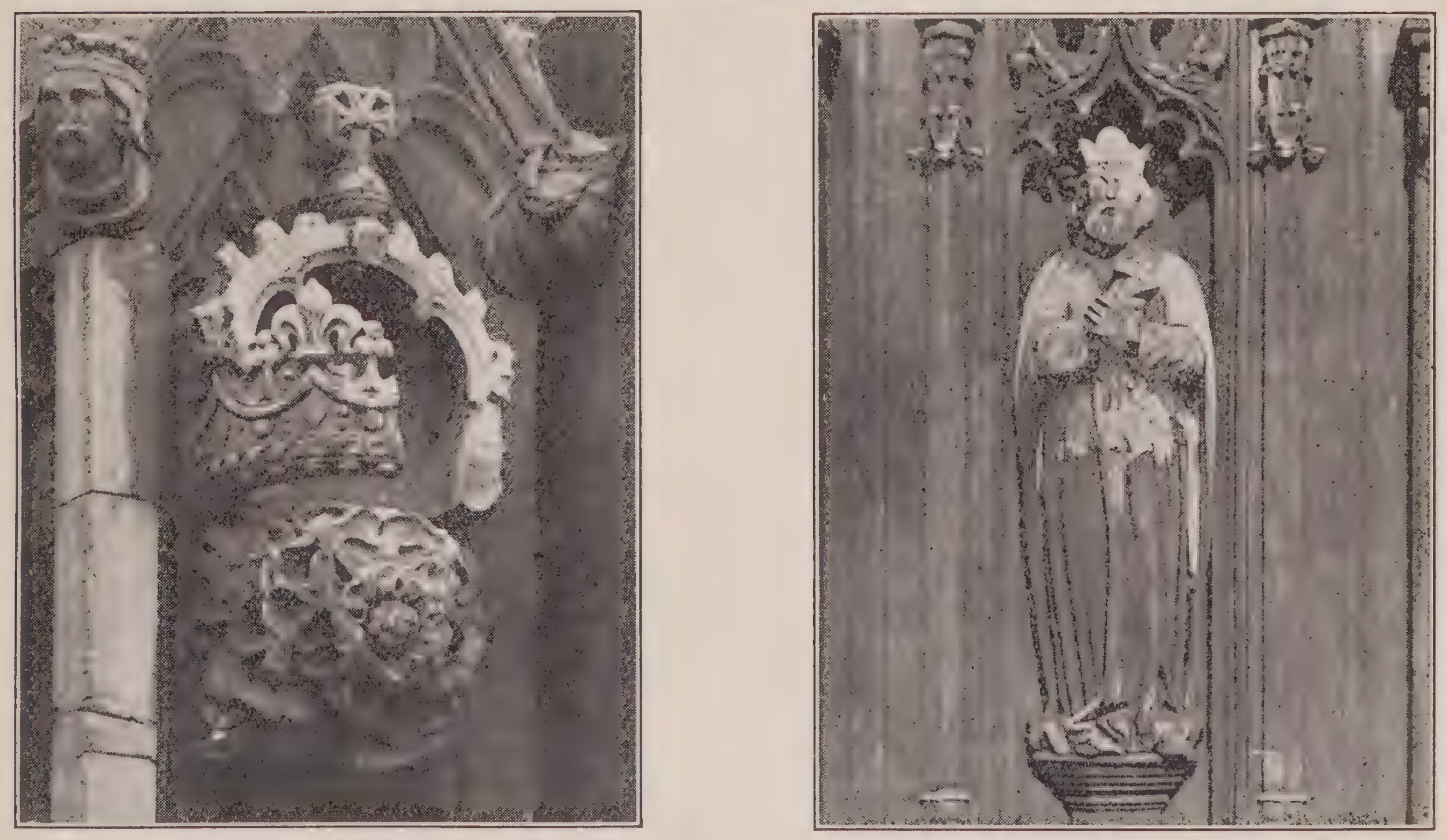
ED. BENNIS & Co. Ltd

LITTLE HULTON, BOLTON
or
28, VICTORIA STREET, LONDON,
S.W. 1.



very efficiently, it was found impossible to produce smoke. The mechanical stokers were speeded up from slow to full load and overload ratings, and back again to practically banked conditions without smoke emission, whereas with the boilers burning a high volatile pea coal, it was difficult to avoid smoking at any change of load. (*This article has been contributed by the Powell Duffryn Steam Coal Company Ltd., which controls large deposits of smokeless coals, of which particulars will be found in the Company's advertisement*).





The above photographs are of ornamental work on the Houses of Parliament and show the effects of atmospheric corrosion on the stonework. Reproduced from "Memorandum on the Defective Condition of the Stonework at the Houses of Parliament" (Cmd 2752), and reproduced by permission of H.M. Stationery Office. Blocks loaned by courtesy of *The Power Engineer*.

Correspondence

Statutory Committees.

The Editor, J.N.S.A.S.

Dear Sir,

The letter from Mr. J. Beaumont, on the above subject, which appeared in your last issue appears to me to call for some comment. He commences to argue from entirely wrong premises, and assumes that the advocates of the formation of Statutory Committees throughout the country would accept an area of the size of the West Riding of Yorkshire as a suitable administrative unit. Any unbiassed student will agree that for any purpose connected with local government such an area, either from the point of view of efficiency or economy, is administratively impossible, and I have no doubt that when any real reform of local government takes place this aspect of the matter will receive some attention.

No, the size of the area should not be determined on either County Borough basis, but in arriving at a decision on this point due regard should be paid to the extend of industry within a given area, together with a number of other factors, with which your readers will be familiar.

I have the greatest respect for Sanitary Inspectors, but we live in a specialist age, and it should be unnecessary to remind a Chief Sanitary Inspector that the duties associated with his profession have grown to such an extent that he already requires to be a walking encyclopedia, if they are to be carried out efficiently. I do not wish to decry the value of the Special certificate of the Royal Sanitary Institute, but I would suggest that in addition to this qualification it is absolutely essential that the Smoke Inspector should have practical knowledge, if this problem is to be tackled efficiently In short, it is becoming more apparent that this is work for the engineer, and my Authority have already recognised this in making appointments to the staff.

There can be no question that a Committe having jurisdiction over the area of several local authorities will carry out the duties better and more impartially than the individual Councils. Our own Authority is a striking example of this. The suggestion that Statutory Committees cannot ensure co-opertaion is a long way wide of the mark. As a matter of fact it was not until we set up the Statutory Committee in my area that we secured the co-operation of the manufacturers, and I venture to assert that there is not any area throughout the country which has done as much in the direction of research.

The setting up of an Examinations Board for stokers and boiler firemen is an excellent idea, but it seems to me to be putting the cart before the horse. What is required is a recognition of the fact that this is skilled work, and that there should be payment of wages commensurate with the responsibility associated with it. Another direction where a little stimulus is required is to persuade manufacturers that it is manifestly unfair both to the stoker and the general public who suffer from excessive smoke emission, to expect him to be a jack of all trades, with the result that he is often attending to other duties when he should be attending the boiler or furnace fire.

To return to the question of co-operation, we have persuaded the manufacturers that our regulations with regard to boilers are reasonable, and it has been placed on record that they will not encourage or support any of their colleagues who transgress. Can the West Riding Regional Smoke Abatement Committee equal this? Personally I hope that the matter will not be allowed to rest until the Government make obligatory the setting up of Statutory Committees throughout the country.

Yours faithfully,

W. Asbury.

Chairman, Sheffield, Rotherham & District Smoke Abatement Committee.

The Editor, J.N.S.A.S.

Dear Sir,

The opinions expressed by Mr. Beaumont in your last issue as to the undesirability of forming Statutory Regional Committees for the supression of factory smoke niusances are hardly borne out by the facts.

The various local authorities have had the smoke niusance clauses of the Public Health Act, 1875, entrusted to them to administer for the past 55 years, with the result that with very few exceptions the law has been more honoured in the breach than in the observance.

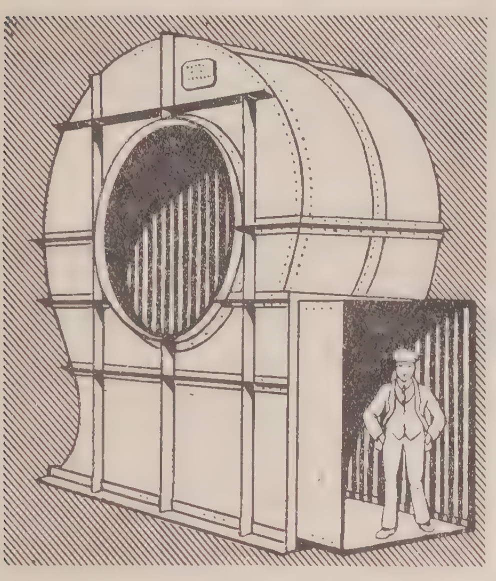
As an illustration of this one may quote the results of an inspection made in South East Lancashire placed before the Manchester Regional Committee by Alderman W. T. Jackson, at a recent meeting. 536 observations taken in 33 of the districts within the Manchester Regional area averaged 9.2 minutes of dense black smoke for each half hour. In practically all these districts the smoke inspection is "carried out by the individual Sanitary Inspector," many of whom "now possess the special certificate of the Royal Sanitary Institute for Smoke Inspectors."

There is evidently something wrong about a method of dealing with smoke nuisance which gives results like the above. From my own personal observation I think that inspection would show that this is typical of most industrial areas.

The same number of observations in a district where whole time smoke inspectors are employed, average 1.8 minutes dense black smoke per half hour.

‘CYCLONE’ FANS

for induced draught



Write for explanatory Booklet 66 F

INDUCED draught for Steam Boilers offers innumerable economies, and to prefer the “Cyclone” system of Induced Draught is the initial economy. Its scientific application of the principles involved and its reasonable cost to instal make it of first consideration.

MORE STEAM—LESS COAL—ELIMINATES BLACK SMOKE

These are the primary advantages the “ yclone” System ensures. Saves you as much as 25% of fuel, and definitely increases boiler efficiency. New boiler houses fitted with “Cyclone” do not need tall chimneys.

MATTHEWS
& YATES LTD
SWINTON MANCHESTER

©

JOHN TURTON & SONS

M. I. P.

PLUMBERS

Domestic Hot and Cold Water
Fitters in all Metals by
Smokeless Fuel, Gas or Electricity
Sanitary and Heating Engineers.

Estimates Given.

43/45, Higher Cambridge Street,
Chorlton-on-Medlock, Manchester

£100 The Subscribers hereby bind themselves to pay the above sum to the Proprietors of any steam boiler or boilers in which the Seotoo Complete Combustion Furnace fails to bring about a saving of from 5% to 25% in fuel costs, and in addition prevents the formation of smoke to the satisfaction of any Municipal or Local Regulations. Only one condition is imposed. The fuel used in the test must be about the lowest grade obtainable. For and on behalf of SMOKE PREVENTION LTD.
H. J. BULLEN, Director and Secretary,
1, Victoria Street, London, S.W.1.
Bankers: Westminster Bank Ltd.,
Caxton House, S.W.1.

The chief reasons for the smoke nuisance clauses becoming a dead letter have been the general reluctance of the local Councils to take action, and also the impossibility for an official to deal satisfactorily with smoke nuisances and at the same time to carry out the numerous duties of a Sanitary Inspector, no matter how highly qualified he may be.

Another point is the want of uniformity of administration and practice. Smoke does not recognize minicipal boundaries and there is a pressing need for the suppression of all unnecessary smoke. This in a degree affects the rural areas as well as those more directly concerned. Mr. Beaumont must know that local authorities are very reluctant to interfere with their neighbours by taking advantage of section 108, and at best it is not a very satisfactory or pleasant thing to do.

What is required is a method of using the Acts which allow the whole time inspection to be carried out and the attainment of uniformity of administration and practice. This can be accomplished by the formation of joint committees (P.H.A. 1926—6) or by the formation of a united district (under the P.H.A. 1875—279).

The most satisfactory plan is for all the authorities in the various geographical units constituting the industrial areas to join together to form statutory bodies for dealing with the smoke nuisance common to all. Undue influence, which has undoubtedly interfered with carrying out the law in the past, would be very largely eliminated.

The present voluntary joint committees are doing a very useful work, especially on the educational side, but I cannot see why a statutory committee should not do equally good work in these directions, and in dealing with manufacturers there is no doubt that in the majority of cases any advice would receive much greater attention if the recipient knew that the advisers had power to enforce it if necessary.

Mr. Beaumont indirectly mentions the cost of such a committee. It is estimated at about 1d. per head of the population per annum ; the smoke nuisance costs £2 per head.

I have heard of an industrial town in America with a population similar to that of Stockport where £6,000 per annum is spent on smoke abatement ; a greater sum than is spent in the whole of the Manchester Regional area for this purpose at the present time.

The Committee on smoke and Noxious Vapours Abatement in their Report (1921) recommended that there should be powers given to constitute Joint Committees, and this was carried out in the 1926 Act, Clause 6. The co-operation of two or more authorities to deal with a problem common to them has been tried in the formation of joint rivers boards with considerable success.

In view of the ghastly failure of our present method of procedure for dealing with the smoke nuisance, why not try this method to mitigate the contamination of the most vital of the necessities of life ? It would not deal with the whole of the problem, but a very considerable percentage of improvement might be effected in this way.

Yours, etc.,
R. MORTON ROWE.

Before you buy your coke
CONSIDER OIL!
Parwinac OIL HEATER for AUTOMATIC CENTRAL HEATING
OBY

Weigh up oil heating against coke—and oil wins every time! Fit a Parwinac Automatic Oil Burning Heater to your present system—you'll be amazed at its convenience, cleanliness, and efficiency. No stoking, no dirt, no odours—just switch on, that's all. Send name and number of your present boiler, with maker's name and ask for fully illustrated Brochure O.B.117.

PARKER, WINDER & ACHURCH, Ltd., Heating Engineers, BIRMINGHAM.
London: 4, Gt. Marlboro' St. W.1. Manchester: 16, John Dalton St. Leicester: 64, London Road.

TELEGRAMS: "WALSH'S, 430 BOLTON"
TELEPHONE: 430

ROBERT WALSH
(ROBERT WALSH)
M.I.H. & V.E. M.I.P.

PLUMBERS, HEATING, LIGHTING AND VENTILATING ENGINEERS

FIRE ESCAPES, APPLIANCES, HOSE REELS, &C., &C.

DAUBHILL, BOLTON

CLEANER CITIES

POWELL DUFFRYN SMOKELESS STEAM COALS are unrivalled for EFFICIENCY, ECONOMY and CLEANLINESS.

There is a SMOKELESS COAL for every use :—
Power Stations, Industrial Plants, Institutions, Laundries, Steam Lorries, etc.

P.D. Smokeless Steam Coals have a very low sulphur and ash content, with a high percentage of fixed carbon.

They are eminently suitable for use in modern mechanical stokers.

SMOKELESS STEAM COAL • PD

BRIGHTER HOMES

POWELL DUFFRYN PHURNOD SMOKELESS COAL

PHURNOD SMOKELESS COAL is suitable for all types of domestic hot water boilers, central heating plants, slow combustion stoves, kitcheners, etc.

PHURNOD makes no soot, possesses great heat value, and is the most economical fuel obtainable at its price.

PHURNOD is obtainable in 3 sizes for various requirements :—

No. 1. Cobbles, for horticultural use and the larger central heating plants.

No. 2. Large Nuts, for the larger type of domestic hot water boilers.

No. 3. Small Nuts, for the smaller type of domestic hot water boilers, slow combustion stoves, kitcheners, etc.

For further particulars apply to :—

STEPHENSON CLARKE & ASSOCIATED COMPANIES LIMITED

4, ST. DUNSTAN'S ALLEY, LONDON, E.C. 3.

And at :—Cardiff, Southampton, Birmingham, Nottingham, Liverpool, Hull,
Newcastle-on-Tyne, Glasgow, Belfast.

FOR

SMOKELESS

STEAM RAISING, CENTRAL HEATING, HOT WATER SUPPLY

BY

PRODUCER GAS FIRED BOILERS
OIL FIRED BOILERS
ELECTRO THERMAL STORAGE

and all Modern Methods consult

SAUNDERS & TAYLOR LTD.

ENGINEERS

Praed Rd. Trafford Park,
MANCHESTER.

118-122, Holborn,
LONDON, E.C. 1.

LET US ADVISE YOU ON ALL YOUR PROBLEMS OF

VENTILATING

DUST REMOVING, STEAM REMOVING, REFUSE COLLECTING, INDUCED DRAUGHT AND HEATING, Etc.

EXPERTS IN THE DESIGN, CONSTRUCTION AND APPLICATION OF FANS FOR ALL PURPOSES

▣

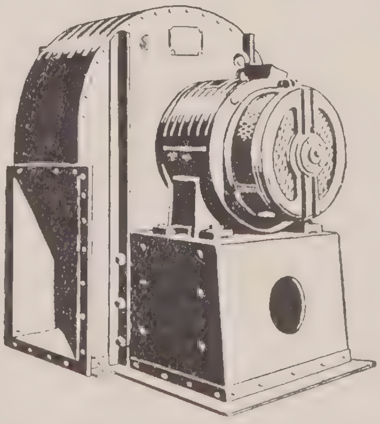
Telephone: 6024 CITY

SCHEMES AND ESTIMATES FOR COMPLETE INSTALLATIONS FREE

Efficiency Guaranteed

▣

Telegrams:
"Exhauster, Manchester."



THE "BRADSHAW" ELECTRIC EXHAUSTER

CALL WRITE OR 'PHONE

The Bradshaw Fan & Ventilating Co., Ltd.

134, DEANSGATE, MANCHESTER.

The Journal of the National Smoke Abatement Society

(The Official Quarterly Organ)

Editor : **Arnold Marsh, M.Sc.Tech.**

Editorial Office:
23, King Street
Manchester
Telephone : Central 1218

Advertisement Office:
The Service Guild
45, Deansgate Arcade, Manchester
Telephone : Central 1165

The Journal of the National Smoke Abatement Society. Vol. 2. No. 7.

CONTENTS OF SUMMER ISSUE

	Page
Commentary	51
A Survey of the Smokeless Solid Fuels. III. Coke	53
The London Meeting	57
"Banish Smoke from Britain"	58
From the Municipalities and Branches ...	61
The Smoke Problem : A Consideration of some of its Economic Aspects and the Difficulties of its Solution	65
Smoke Abatement and the Agriculturist ...	74
Correspondence : Statutory Committees ...	74

COMMENTARY

THE Annual Meeting and Conference of the Society, which will be held in Liverpool during the week-end, September 18th to 20th, should prove to be the most successful yet arranged. The papers are of considerable interest and the other functions in connection with the Conference are additional incentives to attend. The Lord Mayor of Liverpool (Alderman Edward Thompson) is kindly arranging an At Home for the delegates, which will be given in the Town Hall on the Friday evening. On Saturday morning, in the School of Hygiene—an ideal meeting room—will be held the Society's General Meeting, which will be followed by the first session of the Conference, when two papers will be read on "The Progress of the Electrical Grid," by Mr. Robert Blackmore, and "Notes on the Production and Use of the Smokeless Fuel 'Dryco' in Liverpool," by Mr. R. E. Gibson. In the afternoon a tour—by the invitation of the Public Health Committee—will be made, and visits will be paid to the well-known "boulevards," housing estates and to the new Clarence Dock Power Station. The last is only just opening and is of especial interest because it embodies a new process for the removal of grit and sulphur fumes. On the Sunday morning there will be a discussion on the work and progress of the Regional Smoke Abatement Committees, including the question of statutory bodies, and finally a demonstration, by Mr. William H. Roberts, City Analyst of Liverpool, of the latest apparatus and methods for the measurement of atmospheric impurities. The Conference headquarters will be at the Adelphi, where we hope to see a really large number of our members.

* * * * *

The annual congress of the Royal Sanitary Institute, which is the most important of all the health conferences, was held in Glasgow from July 4th to 11th. Two papers on smoke abatement problems were read, the one by Councillor W. Brownhill Smith being summarized in this issue. The other paper, by Dr. Elizabeth Mudie on Smoke and Cancer, was similar to the paper read at the annual meeting of the Scottish Branch, also mentioned in this issue. Mr. Smith's paper was of a somewhat controversial nature, and was replied to, on behalf of the gas industry, by Sir Francis Goodenough. At the Health

Exhibition, arranged in conjunction with the Congress, a stand was occupied, for the first time, by the National Smoke Abatement Society. Considerable interest was taken in the various exhibits and a quantity of the Society's literature was distributed. A bronze medal was awarded for the display. Visits were paid to the Maclaurin low-temperature carbonization plant at the Dalmarnock Gas Works, from which the smokeless fuel "Kincole" is produced, and to the Dalmarnock power station. The refuse destructor and power works at Govan were also visited. Here 550 tons of Glasgow's refuse are dealt with daily ; the screened residue of which is burned under boilers for the production of electricity. 320 units are obtained from each ton consumed, and the station is connected up with the Scottish Central Electricity Board's system. The plant works continuously and a steady day-and-night load is maintained. Paving blocks, kerb-stones, etc., are prepared from the resultant clinker.

* * * * *

Dr. Des Voeux, speaking from the Chair at the recent meeting of the Society, when we had the privilege of hearing Mr. W. Prescott of the Federation of British Industries, said that the meeting marked the burying of the hatchets which had for a long time been flourished by the manufacturers and the smoke abatement workers against each other. "The Mechanical World" commenting on the meeting says that "a spirit of reasonableness has come over the scene and it is not too much to say that the manufacturers, through the Federation of British Industries, and the Smoke Abatement Society, are now well on the way to working hand in hand with the object of achieving what has been striven for hitherto." We sincerely hope that this view is the true one, for the possibility of working hand in hand depends upon those on the smoke abatement side understanding more clearly the problems associated with industry than has been done in the past, and manufacturers realizing and appreciating the gravity of the smoke evil much more than they, from their side, have done hitherto. It is too much to hope that smoke makers and smoke abaters will always see eye to eye in everything for the simple reason that a body advocating a reform of any kind must of necessity, if it is to achieve anything, be in advance of the average opinion. That indeed, is its function, and it is valueless unless it is ahead and therefore open to criticism from those who are not. This does not mean that the F.B.I. is only level with the average manufacturing opinion, for, on the contrary, this organization is also in advance ; mainly from the direction of fuel utilization and combustion efficiency. And it is in these that there is the greatest promise of a noteworthy abatement of industrial smoke. Their annual journal, the "Fuel Economy Review," is indeed one of the most valuable smoke abatement publications.

* * * * *

A misconception which was voiced at this meeting, and which is frequently met with, is that the smoke inspector is a person whose sole task it is to secure cases under the smoke abatement laws. During a recent correspondence in the columns of the "Manchester Guardian" it was stated, quite sincerely, that no training was required for smoke inspection and that the work could be done quite as well and much more cheaply by the police. This, of course, is absurd, for the smoke inspector is, and has to be, a highly trained specialist whose most valuable work is done without recourse to the police court at all. He has not only to be able to observe the nature and quantity of smoke, but must be something of an engineer, a chemist, a fuel technologist and a practical boiler-man. Many once black chimneys are now smokeless through the friendly action and persuasive powers of the smoke inspectors, without the firm in question ever appearing before the magistrates. We are fortunate in knowing many smoke inspectors and without exception they understand and appreciate the problems of the manufacturer and are eminently reasonable and fair-minded. They are very far from being the obnoxious, pouncing people that some apparently imagine them to be, whose one object in life is to harass and annoy industrialists. If the latter only understood this more fully there would perhaps not be the strenuous opposition to laws and bye-laws that is now experienced.

* * * * *

An architect with apparent leanings towards the lighter journalism has been suggesting that London should have skyscrapers high enough to penetrate above the fogs, so that the effects of the "London particular" might be avoided by the simple process of living on top of it. This is much more startling than the common practice of obviating the disastrous results of the loss of sunlight due to the smoke pall by spending large sums of money on artificial sunlight clinics. Another great idea is to pump all the smoke along big flue pipes under the roads to central collecting stations where, presumably, it would be bottled. What a lot of ingenuity, as well as ill-health, labour and expense, will be lost to the world when it is realized that the simplest thing to do is to stop making the smoke !

A Survey of the Smokeless Solid Fuels

III. COKE.

By E. W. L. NICOL, ASSOC. I.C.E., A.M.I.E.E.
(Technical Adviser to the London and Counties Coke Association).

Coke may be described as a solid smokeless fuel obtained by heating, or " carbonizing," coal in retorts from which air is excluded, whereby its non-essential and smoke-producing constituents are driven off in gaseous form.

Incidentally, the " non-essentials " are invaluable to modern convenience, hygiene, industry and agriculture. Destroyed in the furnace, wherein coal is used simply as a fuel, the combustion products destroy, among other things, plant life and vegetation. Collected and sold as a fertilizer, the ammonia by-product makes two blades of grass to grow where only one grew before. Similarly, the numerous other products of coal carbonization and coke manufacture have come to be regarded as indispensable.

A few of the practical advantages of carbonizing coal are, briefly, as follows :—

1. A fuel of higher calorific intensity is obtained, because it has lost its smoke-producing, soot-depositing constituents, which, although themselves possessing considerable calorific power, not only absorb heat during the process of decomposition and volatilization in the firegrate or furnace, but require more air for their combustion and are also easily wasted. Thus, when raw coal is used as fuel, a considerable portion of the potential heat is necessarily used to distil or decompose it, and the net quantity of heat available for useful purposes is, therefore, diminished. The combustion of coal is necessarily a two-stage process ; that of coke is a single stage process.
2. Valuable chemical products are obtained, as well as gas and fuel oils which can be burnt smokelessly and efficiently.
3. The resultant coke burns smokelessly and at a relatively high temperature.
4. Coke does not " run " or " cake " in the fire, thus permitting a free air supply and, consequently, more regular combustion.
5. The volatile sulphur in coal is driven off during carbonisation at high temperature and recovered as a by-product, thus largely eliminating an objectionable element always present in raw coal.
6. The resulting coke requires only the minimum excess of air (30 to 50 per cent.) to effect its complete combustion, whereas, in ordinary practice, bituminous coal is unavoidably allowed a quantity greatly in excess (100 to 200 per cent.) of that theoretically necessary.

From the industrial user's point of view, this latter advantage is by far the most important, as it tends directly, and very materially, to improve the efficiency of steam raising and other heating operations. The proportion of volatile matter contained in a solid fuel is in fact a measure of the difficulty of burning it efficiently without the formation of smoke and consequent waste Bituminous coal contains as much as 35 per cent. volatile matter, including 3 to 5 per cent. hydrogen ; gas coke contains only 1 to 3 per cent. volatile matter, and only a trace of hydrogen.

Where metallurgical coke is the primary product, the process of carbonizing coal is conducted in so-called " Beehive " ovens, and in coke ovens. At gasworks coal is carbonized in various types of retorts, gas being the primary product, and coke the most important secondary product.

The coal carbonized in this country in coke ovens and gas retorts amounts to about 36 million tons in a normal year. In the United States of America, the coal carbonized is more than 86 million tons a year.

Industrial Uses.

The true significance of this latter claim (No. 6) to superior merit and efficiency may be illustrated by the results of recent scientific tests in actual steam boiler practice. The Chief Engineer controlling a number of large institutions using steam for heating and power, consented to have comparative tests made at one institution with coal and gas coke as fuel. The coal was of the highest quality, 14,600 B.Th.U. per lb ; flue gas analyses proved the efficiency of combustion to be low, an average of only 5 per cent. CO_2 being obtained. Coke gave 12 to 15 per cent. CO_2, and more than 15 per cent. less coke was used to maintain the output of steam required. The difference in cost per ton was also considerable, and a saving of more than £500 per annum was effected, on fuel cost alone.

Factories of all descriptions, including the largest and most efficient electric power stations, now use coke exclusively, or in admixture with coal, for steam raising, on its superior merits. Usually no alteration, and no serious alteration, is necessary to enable steam boilers to use coke as fuel. The average evaporation per 1 lb. of coke obtained, where accurate records are kept, is 9 to 10 lb. of water, from and at 212°F., a result that compares very favourably with more expensive fuels.

Gas Coke is used extensively as fuel for central heating and horticultural boilers, its smokeless and non-soot-depositing characteristics rendering it specially suitable for boilers of this description, which have intricate gas passages often difficult to keep in clean and efficient condition, if bituminous coal is used as fuel.

Produced at gas works in every city and township, gas coke is the cheapest and only smokeless solid fuel generally available in this country, the production of so-called smokeless coal being limited to definitely defined areas remote from the larger centres of population. Given a sufficient recognition of its advantages, and utilization of the resultant gas, there is no practical limit to the possible production of coke.

The enormous quantities of coke exported tend to prove that its advantages are more fully recognised in countries where fuel is really expensive, than in the country of its origin and manufacture. The reason for this may be a deep-rooted prejudice based largely upon ignorance, a prejudice which may have been justifiable in the past, when coke was considered a mere by-product of gas manufacture, difficult to ignite, and always associated with the emanation of "fumes."

With the growing demand for abatement of the smoke evil, and recognition of the fact that the only solution is the provision of smokeless fuels in adequate quantity and quality, the manufacture, and grading of coke, and coke sales organizations, designed to give satisfactory service to the public, have been organized by gas undertakings in many districts. The resultant coke fuel and appliances specially designed for its use, give complete satisfaction to both industrial and domestic users. The London and Counties Coke Association has been formed to promote the use of coke as fuel by the propagation of descriptive and technical information, and by developing industrial and domestic coke-burning firegrates, central heating and hot water supply boilers.

Manufacture and Preparation.

The manufacture, sale and distribution of coke has involved the expenditure of a great deal of work and capital in installing modern coke ovens, coke screening, cutting and grading plant at gas works, motor transport for direct delivery to consumers, as well as coke-order and sales organisations. The immense scale upon which these operations are now carried out may be gathered from the fact that in London alone more than two and a half million tons of coke are made, screened, graded, and distributed annually, very largely to domestic consumers for use in open firegrates and coke boilers.

The grades, or sizes, which have proved to be the most popular and efficient are "Large coke," used for the larger capacity central heating and steam boilers; "Broken Coke" (¾in. to 2in.) for open firegrates and the larger capacity domestic hot water boilers; "Coke Nuts" (¾in. to 1¼in.) for the popular domestic Coke Boilers, closed coke stoves and anthracite stoves. Coke breeze (0in. to ½in.) is used extensively for mechanical stokers, and for hand-fired steam boilers, either alone or in admixture with coal, which it renders practically smokeless.

Domestic Uses.

As household fires are mainly responsible for the pollution of the atmosphere, members of the National Smoke Abatement Society are probably more interested in the use of coke as fuel for domestic purposes.

Judged by the coal standard, coke is more difficult to ignite in ordinary open firegrates. This difficulty has probably been the *raison d'etre* for the expenditure of a vast amount of capital and energy in an attempt commercially to produce a "low temperature" coke comparatively easy to ignote; but instead of adapting coke to the old and often uncertain methods of ignition, by means of firewood, the London and Counties Coke Association* have tackled the problem by modernizing methods and appliances.

Open coke firegrates, of which the "Metro" is typical, are provided with fixed gas ignition burners, which, in a few minutes, kindle the fire, positively, every time, without the aid of firewood. Similarly, inset grates are available, applicable to any suitable existing fire-grate, and having the essential feature of an open coke grate, namely, widely spaced bottom fire bars.

Suitably graded coke ("Broken") is ignited in these, or any suitable firegrate, by means of a new portable (patent application No. 19,946) gas fire-lighter, with certainty, in a few minutes. This monentary re-union of the two principles constituents of coal, divorced in the process of carbonization, has proved to be entirely successful. Incidentally, this method of kindling the ordinary coal fire has obvious advantages, as it not only saves the time and labour of "laying" with paper and firewood, but also tends to eliminate the particularly dense smoke that unavoidably emanates from coal fires in the process of kindling with firewood. The cost of the gas so used is estimated to be less than half that of the equivalent amount of firewood as sold in bundles weighing about ½ lb. each.

Bearing upon the important question of comparative cost and efficiency of coke and coal as fuel for open fires, the reports on official tests, made in London and Salford, may be quoted. Published in the "Manchester Guardian" the report of Dr. Osborne, Medical Officer of Health, Salford, states that a seven days' test in rooms, exactly similar, the same temperature was maintained with a daily consumption of only 15¼ lb. of coke, as compared with 22¼ lb. of coal. The saving effected was more than one-third, plus the difference in cost, and "the coke gave a beautiful radiant fire and no smoke whatever; nor was there at any time any evidence of sulphur fumes in the room in which this fuel was being used."

The Medical Superintendent of an important London Hospital, using "Metro" coke fires, reported a saving of 45 per cent. on the weight of fuel used, and 55 per cent. on cost, and recommended the installation of coke

---

* The London and Counties Coke Association,
9, Grosvenor Gardens, London, S.W.1.

W-D

Our Ideal

"A Smokeless City"

The

WOODALL-DUCKHAM COMPANY

are

manufacturers of

Continuous Vertical Retorts

Intermittent Vertical Chambers

and

Other Plants

for

Conserving Coal

and

Providing Smokeless Fuels

Head Office:-

ALLINGTON HOUSE 136-150 Victoria St., LONDON. S.W.1

District Offices:-

MANCHESTER
78 King St.,

GLASGOW
82 Gordon St.,

SHEFFIELD
22 High St.,

THE WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO., (1920) LTD.

Spring Cleanliness Every Day

Electricity Ensures Clean Air Everywhere

In your attack on dust and dirt every day your best aid is an Electric Suction Cleaner.

The Electric way of cleaning, collects dirt and allows it to be destroyed without danger to health or scattering the dust everywhere.

It is important in a house where there are children that the floor should be free from germ-carrying dust.

Use Electricity for Lighting, Heating, Cooking and Domestic Help

Send for a free copy of "The House you Want"
issued by
THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.
15, Savoy Street, London, W.C.2.

fires in all the wards of the hospital, numbering more than 300. The fact that open coke fires are now being installed in hospital wards should, incidentally, tend to allay any doubt as to the emission of sulphur fumes.

Dr. Margaret Fishenden, of H.M. Fuel Research Department, comparing household coal and gas coke, states : " dry gas coke gives a higher and more uniform heating effect than raw coal in open grates, and gives radiation efficiencies of 24 per cent. to 28.5 per cent., as compared with 21 per cent. and 24.5 per cent. for good house coal.

Central Heating and Hot Water Supply.

The supply of hot water for domestic and household uses, either continuously or intermittently, by means of the coalfired kitchen range boiler, is probably the cause of considerable smoke emission. The specification and introduction by the London Coke Committee of a standard type coke boiler has proved immensely popular. Combined with a gas cooker, and open coke fire, it has completely solved the problem of domestic smoke emission in many households. As an indication of its popularity, it may be stated that one firm, probably the largest of many different makers, made and sold in one year, 70,000 coke boilers. Designed for use with coke, for which purpose coke is specially cut and graded in ever increasing quantities, the coke boiler not only supplies hot water in abundance, but also warms the house by means of radiators, if required, at a cost of about 6d. per day for coke.

Ignited by means of the new gas fire-lighter, the coke boiler may be used intermittently, if so desired ; an early hot bath may be drawn off in less than 45 minutes, from the time of applying the fire-lighter, with a few pounds of coke, together with the gas used for ignition, costing less than 2d. The hot water accumulated in the (insulated) storage tank or cylinder, serves for household purposes after the fire is extinguished. This intermittent hot water service is greatly appreciated in warm weather, when a fire in the kitchen is neither desirable nor necessary.

Coke fires may, of course, be kindled in open fire-grates and coke boilers in the usual manner, with paper and firewood ; or coal may be used to start the fire.

The advantages of mixing coal and coke for use in open firegrates and kitchen ranges is perhaps not fully recognised, nor the possible influence of this simple practice upon the formation and emission of smoke from domestic chimneys.

As is well known, the volatile or smoke-providing constituent of household coal may be as high as 35 per cent. by weight, while that of coke is practically nil. The obvious effect of mixing the two fuels in equal proportion is to reduce by half the possible production of smoke ; but an open fire, once established, can advantageously consume a much higher proportion of coke, this reducing still further the emission of smoke, and tending very materially to improve the radiation efficiency of the fire.

The London Meeting

SMOKE ABATEMENT FROM THE MANUFACTURERS' POINT OF VIEW.

A meeting of the Society was held at 71, Eccleston Square on July 16th, the semi-annual meeting of the Council being followed by an address by Mr. W. Prescott of the Federation of British Industries, on the subject of " Smoke Abatement from the Manufacturers' Point of View." Mr. Prescott said that in time a smokeless fuel might be available which would enable the whole problem of industrial smoke to be cleared up, but we were not yet in that position, and for the moment it was necessary to deal with the matter on the basis of a fair agreement between all concerned. The main function of a manufacturer was to run his works at a profit, and he hoped that the smoke abatement enthusiasts would accept that as a general principle. The majority of manufacturers were now paying close attention to fuel utilization, but there still remained the personal element of those using the plants, and there was little control here. As inventive genius progressed we were getting devices for control which were limiting the immediate consequences of the personal factor. We should never get rid of this altogether, but he had every confidence that in time it would be considerably reduced. In the meantime serious efforts were being made to educate stokers and others in the efficient handling of fuel plants, but there were certain criticisms which could legitimately be made of the present courses dealing with fuel practice. There were two ways of looking at the matter. One was the best method of carrying out the conventional operations, and the second was the research or technical side of the problem. In his opinion stokers did not need to become skilled fuel technologists in order to run their plants properly, and any attempt to teach the stoker to become a skilled fuel technologist must fail. It was first-hand practical training that was of the greatest importance.

Speaking of legislation and of the local advisory committees empowered to be constituted under the 1926 Act, Mr. Prescott said that it was a step forward if they could be brought to sit at a table with the local manufacturers—and not on opposite sides—and discuss the best method of tackling the local problem. The Federation did not suggest that industry should be granted all that it asked, and it certainly would not agree that the Society should be given everything it asked for, but if the two sides could get together amicably in the local areas there should be accumulated a mass of information which would serve as the nucleus of some national action within limits, although the smoke problem would always be largely a local one according to the particular conditions. The Federation of British Industries was anxious to co-operate in this matter and, indeed, had already been taking action. A good deal had been said of devices which would completely cure the smoke evil, but the Federation was prepared to test all such devices and perhaps in this way it would be possible to get rid of much of the type of propaganda he had mentioned. Much of the smoke abatement propaganda was well directed, but some of it was not, and this type get people on the raw, especially when they knew they were working their plants in an efficient manner. Developments rested on co-operation, and that could only be progressive when the manufacturers realized their responsibilities to the local authorities, and when those responsible for smoke administration did not regard every manufacturer who might put up smoke during the day as being as black as the smoke his factory chimneys emitted.

Sir Francis Goodenough, Mr. J. W. Beaumont, Dr. A. A. Mussen, Mr. Fellowes, Mr. H. L. Pirie, and others spoke in the discussion, which was concluded by remarks from the President, Dr. H. A. Des Voeux, who had presided at the meeting. A hearty vote of thanks to Mr. Prescott for his valuable address terminated the proceedings.

(*This meeting is discussed in the " Commentary "*).

"Banish Smoke from Britain"

By W. BROWNHILL SMITH, M.V.O., D.L.

The following paper was read by Councillor Smith at the Royal Sanitary Institute Congress at Glasgow, and is of a somewhat controversial character. We are glad to be able to publish it and hope that those who do not agree with the views expressed will take the opportunity of replying.

To prevent smoke we must prohibit the burning of coal in its raw state, but before we can do this we must provide substitutes that will be more convenient and more economical.

It is our duty as health authorities to bring this change about, and we are strengthened in taking action when we realize that we are not only getting all the advantages by better health for the community, improving the amenities of cities and towns, but, in addition, we are aiding our industries by lowering the cost of heat energy used in production. The only way to do this is to carbonize the coal that comes from our pits, separating it out into its three principal constituents—a solid, a liquid, and a gas ; and do this by new methods that give better results than ordinary gasworks practice.

The solid portion, practically pure carbon, is a smokeless fuel that can be burned as easily as coal in the grates and fire-places at present in use, without making any alteration in them.

With " Kincole " that Glasgow Corporation makes, the consumers find that in place of every three tons of coal they used, now they require only two tons of " Kincole " to last the same time, and they get more heat from it than from raw coal.

It can be used instead of anthracite in stoves and boilers, and is an ideal fuel for steam raising in all kinds of boilers—factory, locomotive, or marine—without any alteration requiring to be made in the grates or flues.

The liquid portion is an oil, of complex composition, quite different from gasworks' tar and of more value. It can be used as creosote and fuel oil, but there are many by-products that the chemists are separating out that will fetch a higher price. A series of dyes and pigments are obtained from it, also varnishes, lubricants, and disinfectants.

In this connection, the Royal Commission on the Coal Industry (1925) said :—

> " The nation would obtain from its own soil a considerable supply of oil for use in internal combustion engines and other purposes for which natural oils are now imported.
>
> " This would offer a measure of security against the possibility that the world's supplies of natural oil fall short of the demand, with a consequent excessive rise in price. It would render this country to a large extent independent of imported oil supplies for the Navy, Army and Air Force. If it were possible to subject to this process the bulk of the 147,000,000 tons of coal now consumed annually in the raw state, the greater part, at least, of our present requirements could be supplied from home sources instead of being imported from abroad."

Regarding the third product, gas, I repeat to-day with still greater emphasis, and now with proof, what I said over twenty-one years ago.

In an address to the North British Gas Managers' Association in April, 1910, I said :—

> " In the whole history of the gasmaking industry there never was a time when its prospects of usefulness to the community were so great as they are to-day. Gas originally intended for lighting only, has become a necessity for cooking and heating in the house, and for many manufacturing processes in the workshop, and now that public feeling is so strongly roused to the necessity for a purer atmosphere as essential to the better health and longer life of the community, the scope of gas using is greatly enlarged.
>
> " The pressing need for smokeless fuel demand that your energies be specially directed to two objects,

COKE FIRES

Smokeless
Labour-Saving
Economical
Attractive.

Write or Telephone to :-

C. H. Kempton & Co. Ltd.

72, BENNERLEY ROAD,
S.W. 11
BATTERSEA 4991

Head Office :-
STANGATE HOUSE,
WESTMINSTER BRIDGE RD.,
S.E. 1.

FOR CLEAN AIR AND
MAXIMUM SUNLIGHT

USE THE SMOKELESS COAL
NATURE HAS HERSELF PROVIDED

ANTHRACITE

ABSOLUTELY SMOKELESS
HIGHEST IN CARBON, LOWEST IN ASH
VERY SLOW BURNING
SAFE, CLEAN AND ECONOMICAL IN USE
MINIMUM ATTENTION—IT NEVER GOES OUT

THE BEST FUEL FOR—
DOMESTIC HOT WATER BOILERS
CENTRAL HEATING
OFFICE, WAREHOUSE, GREENHOUSE AND GARAGE HEATING

……

ENQUIRIES AND DESCRIPTIVE LEAFLETS :—

AMALGAMATED ANTHRACITE COLLIERIES LTD.
120, FENCHURCH STREET,
LONDON, E.C. 3.

which, fortunately, are not antagonistic to each other. In the first place we will want much larger quantities of gas of lower illuminating quality and at greatly reduced prices ; and, secondly, we require for many purposes a better by-product than the present form of coke—something that can be burned in ordinary grates."

The Fuel Research Board, in a report on gas standards published by the Department of Scientific and Industrial Research in 1922, said :—

> " The sheet anchor of the gas industry in the future must necessarily be its possession of the cheapest known means of distributing potential heat energy in a convenient form. For lighting and for power production the electric supply of the future may seriously contest the fields with the producers of gas, but for the supply of heat, gaseous fuel ought to remain supreme, if its production and use are developed on sound lines.
>
> " While it is admitted that, in general, duplications of mains and supply are quite out of the question, yet it might be quite feasible to have supply gas pipes delivering different supplies over a short radius from the gasworks. A more general adoption of a dual system may not be so far off as many of us have supposed."

Since this report was issued, we are finding that duplicate mains are not necessary, because this industrial gas is equally suitable for a town's supply for all purposes ; in some respects it is even better than the higher calorific-value gas at present in use, and it can be made and sold at less than half the price for domestic use and still less for industrial purposes.

It is the duty of gas undertakings in or near industrial areas to supply gas of such quality and price as would induce manufacturers to use it in preference to raw coal.

To do this new methods must be adopted. The old way of putting comparatively small quantities of coal, from three to seven tons, into an oven and roasting it at a very high temperature, by applying heat to the outside, must be superseded by a new method of putting a large quantity of coal, about thirty tons, into a vessel and carbonizing it at a much lower temperature, by heat generated by consuming a very little of the coal throughout its own mass.

The former method is hampered by the fact that coal is a bad conductor of heat, and when a quantity of it is placed into the oven, the heat applied to the outside must be of very high temperature, so as to penetrate through to the walls of the retort, and right through the mass of coal, so that it is completely carbonized to its centre. In the new method, as the heat is generated by the combustion of just sufficient air round each separate lump of coal, that heat has only to pass from the oustide to the inside of that individual piece of coal, at most a distance of abour two inches.

This ensures great economy. The Fuel Research Board gave the heat loss as only 2.85 per cent., as against 8 per cent. lost in the externally heated retorts now used in the gasworks. Also, the amount of fuel required to carbonize the coal is less, because it is done at a much lower temperature. With these means at our disposal, it amounts to almost criminal neglect if we delay taking action.

From the Municipalities and Branches

The Scottish Branch.

ANNUAL MEETING.

The Annual Meeting of the Scottish Branch was held in Dundee on May 16th, and was attended by about 80 delegates, principally from local authorities. A most interesting paper, dealing with an aspect of air pollution that had not previously been dealt with so fully, was read by Dr. Elizabeth C. Mudie, of Skelmorie, whose subject was " Coal Smoke and Cancer." Cancer, she said, was the greatest medical and economic problem of modern times. A perusal of tables compiled under the auspices of the Cancer Research Institute was sufficient to convince any but the most prejudiced that the incidence of cancer in occupations involving the handling and inhaling of soot and tarry products was alarmingly great and that the heaviest toll of death was taken from the chimney sweeps who handled the soot from the domestic grates.

It would be crass stupidity to suggest that all cancers were caused by coal smoke, but cancer, like insanity, appeared to increase with the march of civilization, and in order to get back to the immunity enjoyed by the primitive races, it was necessary to revert to a more primitive method of living, and the very first step in this direction was to clean the sky.

Bailie Violet M. Craig Robertson, convenor of the Public Health Committee, Glasgow, read a paper on " The Effect of Smoke upon Health." In the course of the discussion, Bailie Munro, Glasgow, said that he would make it a penal offence to use raw coal for any purpose except the making of oil, gas or a smokeless fuel.

On the proposal of Mr. Arthur Brady, Coatbridge, a resolution was passed welcoming the proposals of the Government for the extracting of oil from coal, and urging the Government to expedite matters in order that an abundant supply of smokeless fuel might be produced and that the burning of raw coal for domestic purposes might as soon as possible be prohibited.

Councillor W. Brownhill Smith in a paper on " The Final Solution of the Smoke Evil," quoted figures showing that the price of gas had increased 127% from 1912 to 1929, whereas the price of electricity had increased only 21%. He attributed it to the gas undertakings not looking ahead and changing their methods, but keeping in the old grooves where they were being superseded by electricity. Mr. Thomas M. Ashford, senior smoke inspector, Glasgow, read a paper on "Control of Industrial Smoke."

The delegates were entertained to lunch by the Corporation.

ANNUAL REPORT.

The Annual Report of the Scottish Branch of the Society reveals that the energetic work that is being carried out is having gratifying results, and that the Branch can claim to have done much in the improvement that is taking place in the Scottish industrial areas. The cleansing of Glasgow's atmosphere is umistakably shown in the following figures, showing the deposit of tarry matter and sulphates as recorded at the nine Glasgow stations :—

Annual Average for all Glasgow Stations (9).
(Tons per square mile).

	1915-16	1925-26	1929-30
Sulphates	19.01	45.56	34.42
Tarry Matter ..	7.56	3.16	2.11

The classes for Firemen were conducted again during the winter months of the Session 1930-31. The enrolments in the Advanced Class numbered 22 and in the Ordinary Class 79. It is encouraging to note that during the past Session a class was instituted in Coatbridge, which is in the centre of the iron and steel manufacturing district of Scotland.

The Report states: "In the fourteen years during which the Classes for firemen have been in operation, 1,185 men have enrolled, and it may be fairly claimed that tuition received by that body of men in the most economical methods of fuel combustion, and how to obtain the maximum of heat with the prevention of unnecessary smoke, must have had its effect in helping to bring about a purer atmosphere."

A further resolution calling upon the Secretary of State for Scotland to take the steps necessary to have introduced a Bill for Scotland similar to the Public Health (Smoke Abatement) Act, 1926, which applies only to England and Wales, has been passed and forwarded, not only by the Branch Council, but by the Town Councils of Glasgow, Edinburgh, Coatbridge, Airdrie, Hamilton, Irvine, Greenock, Motherwell, Port Glasgow, Rutherglen and Stirling, by the County Councils of Ayrshire and Renfrewshire, and by the National Smoke Abatement Society. There is, however, no indication that the request is receiving consideration.

The Branch which is supported mainly by the Scottish Local Authorities, appeals for greater membership of the public, which, as the membership fee is only a nominal one of 2/6 a year, should be forthcoming from all who wish to associate themselves with this movement in Scotland.

The Manchester Branch.

A well attended public meeting of the Branch was ddressed by Dr. R. Veitch Clark, who dealt with the work done by the Manchester and District Regional Smoke Abatement Committee since its formation about six years ago, and stressed the importance of setting up a Statutory Committee for the same area. Principal Mouat Jones of the Manchester College of Technology also spoke on the part to be played by education in solving the smoke problem. He dealt with the technical progress made and suggested that some teaching as to the harmful effects of a smoky atmosphere and practical methods of lessening smoke should be made part of the ordinary health teaching in the Elementary Schools. He offered to arrange a course for Teachers with that object. The Manchester Education Committee has been unofficially approached in the matter, and though the school curriculum leaves little room for further subjects, it is thought that something may be done, at least by exhibiting in the schools charts or pictures showing some of the damage caused by smoke. A joint meeting of the Branch with the Sunlight League was arranged to take place on May 5th, but unfortunately Dr. Saleeby, who was to have been the principal speaker, bringing with him a film of Dr. Rollier's work in Switzerland, was at the last moment prevented from coming. It is hoped that this meeting will take place in the Autumn. Two joint meetings with the Women's Citizens Association are being arranged for next session. The Branch has suffered a great loss by the transference of Dr. Hewlett Johnson from Manchester to Canterbury. While wishing him all happiness in his new sphere we are confident his influence will still be felt making life cleaner, healthier and happier in our district. It has been suggested that the Branch should sponsor the raising of a fund to complete the cleaning of the interior of the Manchester Cathedral, the Lady Chapel and Western Tower of which were cleaned under the Dean's initiative. There has already been a response to this suggestion, and if sufficient offers are forthcoming a further announcement will be made.

The Manchester Regional Committee.

A further step towards the formation of a statutory committee was taken when the existing Manchester and District Regional Smoke Abatement Committee met at the Manchester Town Hall on July 14th. At the previous meeting, convened to discuss the advisability of a statutory committee the Executive was instructed to draw up a detailed scheme for consideration. This scheme was placed before the Committee at the later meeting, was accepted, and is now being forwarded to the local authorities concerned for their approval, amendment or rejection.

The draft scheme prepared estimates of a total cost of the Statutory Committee's work at £13,500 a year, this being required in twenty inspectorial districts. It is proposed that the composition of the Committee be based on proportion of population, with a membership of forty.

HOUSEWIVES recommend the “Metro” open smokeless coke fire because it saves the work of fire making and hearth cleaning, burns brightly without attention for three to four hours, and is cheaper in use than a coal fire.

A “Metro” coke fire is practically dustless, and so room cleaning is reduced and curtains and hangings keep clean for a longer period.

Follow the lead of numerous doctors and hospitals by installing a “Metro” coke fire in *your* home. Every “Metro” coke fire in use helps to reduce the smoke pall which brings destruction and disease in its train.

An illustrated list of all types of “Metro” coke fires will be forwarded on request.

SIDNEY FLAVEL & CO. LTD.

Stove Makers since the reign of King George III

LEAMINGTON

Wipe out that smoke!

"BENNIS" STOKERS

ensure

ABSOLUTELY SMOKELESS COMBUSTION

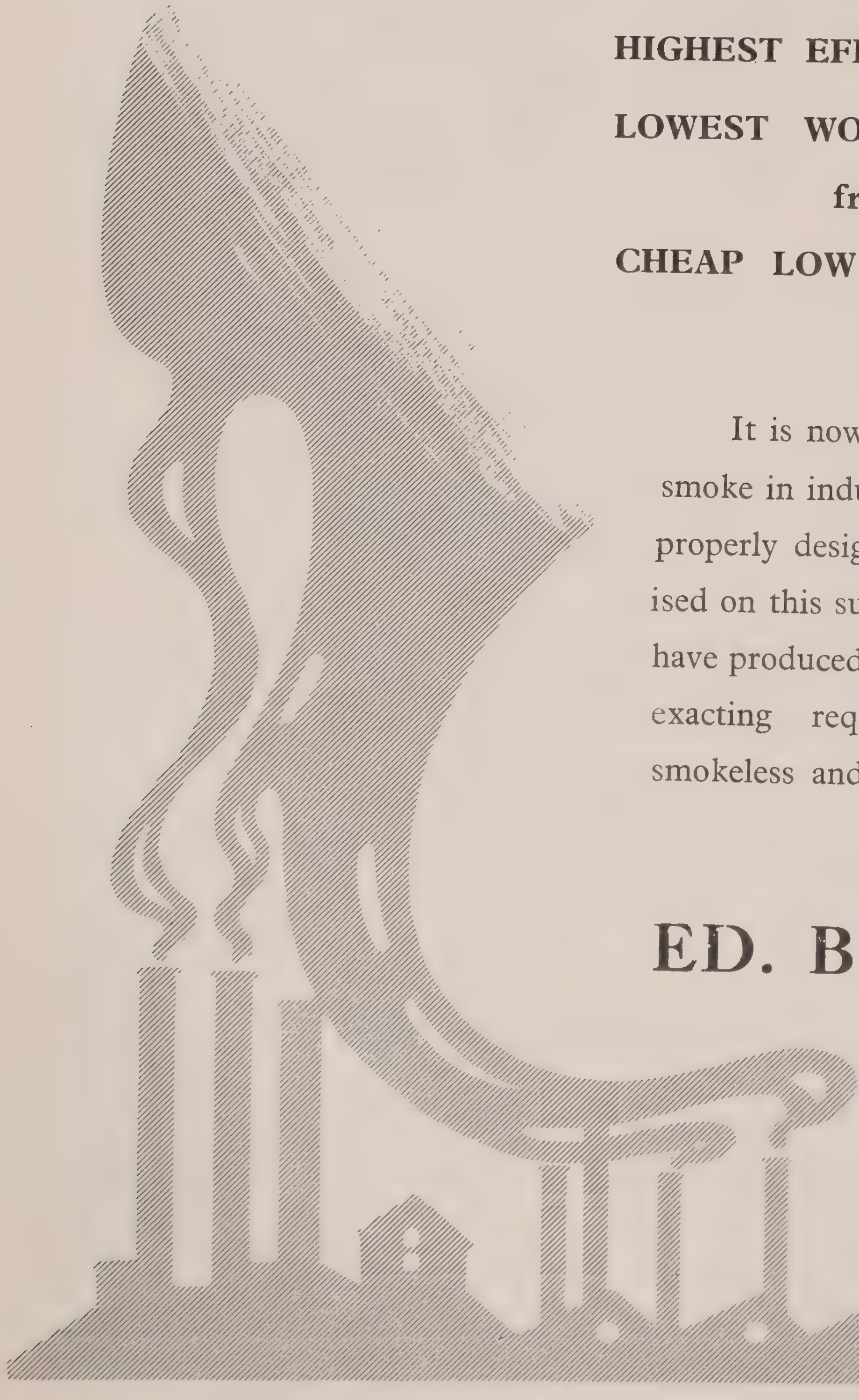
combined with

HIGHEST EFFICIENCY AND

LOWEST WORKING COSTS

from

CHEAP LOW-GRADE COAL



It is now a well established fact that the emission of smoke in industrial works can be prevented by the use of properly designed mechanical stokers. We have specialised on this subject for many years and can fairly claim to have produced a mechanical stoker which will fill the most exacting requirements whilst remaining absolutely smokeless and gritless.

For Full Particulars write to

ED. BENNIS & Co Ltd

LITTLE HULTON, BOLTON
or
28, VICTORIA STREET, LONDON,
S.W. 1.

The Smoke Problem.

A consideration of some of its economic aspects and the difficulties of its solution.

BY ARNOLD MARSH, M.SC.TECH.

(A Paper presented to the Members of the Institute of Fuel, London on April 15th, and Birmingham, April 22nd, 1931).

Before commencing this consideration of some of the many problems relating to the coal smoke nuisance, it must be admitted that there is actually nothing radically new to propound, nor are there any fresh suggestions of any moment to be introduced. The paper seeks only to review and to tabulate the present position stressing what appear to be the more important features, in the hope that it may be of some value to all who are interested in the problem, and that the subsequent discussion may bear useful fruit.

The solution of the problem is largely dependant upon numerous technical matters, which are frequently considered by scientific associations, and while the present paper will attempt to draw attention to a few of the principal factors which are of such interest, it will consider them not from a purely technical viewpoint, but rather as they appear to those concerned with the subject from what may, for want of a more descriptive term, be referred to as the propagandist side.

No attempt will be made even to sketch the historical side, nor yet to present the case for smoke prevention, except as an economic question. It is assumed that here there is no necessity to debate the urgency of the need for smoke abatement, nor the hope of its ultimate abolition.

THE ECONOMIC CONSEQUENCES.

The effects of the nine million tons of smoke (1) which are puored from our domestic and industrial chimneys every year are well known, even though they are not sufficiently appreciated. The spoilation of our historic buildings, (2) the disastrous effects upon vegetation, (3) the drabness and dirt from which our cities cannot escape, and, above all, the appalling and far-reaching effects upon health, both directly by the inhalation of poisonous matter and indirectly by the obscuration of sunlight, (4) constitute the chief indictments against the nuisance.

The purely economic effects, which will be considered briefly, are largely unrealised, as is frequently the case with many of our individual or communal actions. From the birth of the smoke until it reaches its final stage there is one serious loss after another.

Firstly, since all the smoke worthy of consideration is that produced from bituminous coal, there is the national economic loss occasioned by using as a finished product what is actually a raw material. The prosperity of the basic coal industry and the conservation of the nation's coal supplies are two major factors in the structure of the country's well-being. Every diminution in the use of raw coal and increase in the use of pre-treated coal must, because it is increasing the value of the mine product, tend towards making the industry more prosperous, and, because it is using coal to a greater advantage, is conserving the supplies in what is really the only profitable way.

By so using our bituminous coal smoke abatement may be brought about almost incidentally, or conversely, by a strong demand for smokeless mediums, encouragement would be given to the methods by which these desirable objects can best be achieved. In the present circumstances there is the primary waste of an untold amount of potential wealth, which is not only lost but is released as a most active agent for the destruction of wealth.

Secondly, the smoke emitted is simply unburnt combustible matter, and represents a loss to the coal user. It is estimated that three millions ton of coal are wasted in this way each year, (5) representing three day's output of all the collieries in Great Britain (6) This is a loss to the nation and a costly waste to the user, be he manufacturer or householder.

Thirdly, while the smoke is drifting about in the atmosphere it is causing loss by cutting off a large proportion of the daylight. Thus, on a three years' average, Manchester received only 55 per cent. of the quantity of sunlight received at a village lying only eight miles away. (4) A still larger proportion of the ultra-violet radiation is lost. There is a direct economic loss here due to extra lighting requirements but the principal effect is that upon health and vitality, especially of children. Not only are there the direct physical results—this loss of light is one of the two main causes of rickets—but resistance to disease is lowered, and there are manifold psychological effects which will be familiar to all.

Fourthly, the smoke descends as a deposit of soot and grit rendered corrosive by sulphurous acid and adhesive by tar. The highest figure in those towns taking observations for the year ended March, 1930, was the Netherfield Road station at Liverpool, with a deposit of 1,840 grams per square dekametre (717 tons per square mile).(7)The chief results of this are those brought about by the inhalation of this noxious mixture, the actual destruction of property, generally by corrosion, and the enormous labour and cost entailed in cleaning, washing, painting, decorating and repairing in all that the deposit falls upon. The resigned, acquiescent way in which this appalling and perpetual rain of filth is accepted is amazing, and would not for a moment be tolerated by a truly civilized community.

This four-fold wastage and havoc occasioned by smoke is undoubtedly one of the most serious economic problems that need to be considered at the present day, and it is rendered more serious by its gradual and almost unnoticeable action, which is therefore so commonplace and devoid of " news value " that it is accepted as natural and part of the price to be paid for living in an industrial state.

Without attempting to bring into consideration the two important factors of the waste of potential wealth through the indiscriminate combustion of raw coal, and the considerable purely economic results of the lowering of the health standard, it is estimated that the cost of smoke to the nation is in the region of £80,000,000 a year. It is, of course, quite impossible to attempt to obtain any precise and scientifically exact figure, and this sum is mentioned only as being a considered approximation of the cost of the more assessable items, and is based on the Pittsburgh investigation, (8) which is the only exhaustive inquiry.

If this sum, which capitalized would exceed the whole of the external national debt, were only one-tenth of what it is, a reduction would still be a question of prime importance. The loss is, however, largely unnoticed, for it is made up of countless small items, many of which—such as the loss caused by the household fire—are not actually realized. Further, much of the amount is expended in what is superficially useful work. But the true loss has to be measured in terms of real wealth, and not in terms of cash, for that continues to circulate and does not disappear. For example, to have to paint a building twice as frequently as should be necessary may provide business and employment for the decorating trades, but it is at the expense of a demand for commodities produced elsewhere, and actually adds no more to the nation's wealth than does the employment given by the well-known process of digging and refilling holes.

Because of the money and labour expended as a result of the smoke evil the country is deprived of £80,000,000 worth of real wealth each year, and is consequently so much poorer than it might be by that amount. The actuality may be visualised by an apposite analogy of 300,000 cars being produced each year and being driven straight from Cowley or Coventry into the sea.

By abating the nuisance the money and labour now vested in cleaning up after it would become at once free for other more useful purposes, and the prosperity of the nation would correspondingly increase. Therefore, instead of the question being neglected and put on one side during a time of national crisis and industrial depression, it would appear that such a period actually increases the urgency for grappling firmly with it and for endeavouring to minimize the deplorable and extensive waste that it entails.

While it is more fitting that the consequences of smoke upon human health should be considered upon a higher plane, yet the simple economic effects of this must also be borne in mind. Much respiratory trouble is either induced or aggravated by irritation set up by smoke particles, absence of sunlight reduces vitality and increases liability to infection, and it is, therefore, certain that a considerable proportion of the working days lost to industry each year are due to the unhealthy atmosphere breathed continually by workers of every description. In addition there is the less tangible but equally certain psychological consequences of living in drab, dirty and darkened surroundings, and a restoration of clean air and full sunlight would mean an increase in general happiness and content. In short, we should all be living more keenly and healthily, and with a saner, more tolerant and more cheerful outlook on life and towards all our complex relations with each other in every sphere of activity.

While the health aspect has not been considered at all fully in this paper, there will probably be general agreement that this, above all others, is the gravest of all charges against smoke, and would alone render it imperative that every possible step be taken to abolish the evil.

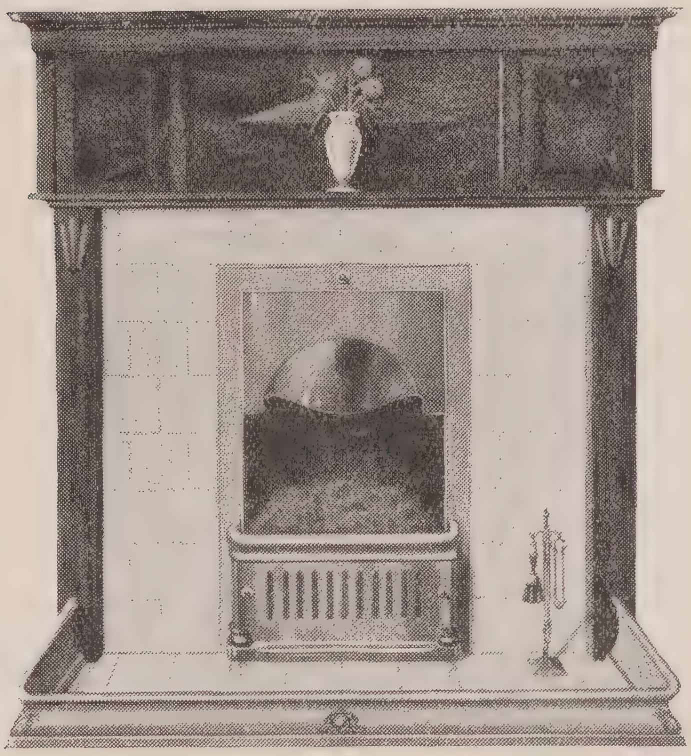
Industrial Smoke.

The nuisance falls into two sharply divided categories, domestic smoke and smoke resulting from industrial operations, the remedies for which are totally different and need to be considered separately. There is also a third type of smoke which links the main classes, namely, that arising from the warming of large buildings, and which may be termed " commercial " smoke. Opinions vary as to which class, industrial or domestic, is the major offender, and much controversy has taken place on the matter, to continue which would serve no useful purpose. When in danger of being run down by two motor buses it is more profitable to escape both than to deliberate upon their comparative velocities.

While there are minor sources of atmospheric pollution the principal one is easily that due to coal smoke, which is brought about by the incomplete combustion of bituminous coal. The remedies are two: The application of methods which will secure a complete and efficient combustion of raw coal, and the substitution of smokeless for smoke producing mediums. Domestic smoke abatement is mainly being brought about only by the latter method, and industrial by both. The progress of science and technology in each direction is

‘SANTORE’ the new Coke Fire

Economy of Fuel
Bright open fire
Smokeless
Sliding Canopy
Ventilating Front



Perfect Control of Fire from dull red to bright white
Adapted for Hot Water Supply if required.

Stout Cast Iron Interior, Cast Iron Fire Bars, Damper and frame fitted Wrot Iron Rod and Knob. Refractory Fire brick back and bottom.

Write for details and modes of Fittings to the makers ……………………………………………………………

NEWTON CHAMBERS & Co., LTD.
MOORHEAD,
SHEFFIELD, Eng.

Tel. Add.: “ENSEE,” SHEFFIELD.
Tel. No. 20351 (2 Lines).

M
B

NO

SMOKE SOOT
DUST or ASHES

if you let HADENS instal MODERN SYSTEMS for

STEAM RAISING, CENTRAL HEATING,
HOT WATER SUPPLY, VENTILATION,
by
OIL-FIRED BOILERS
ELECTRIC THERMAL STORAGE

Extensive Experience.

Many Installations.

G. N. **HADEN** & SONS
Estab. 1816 LIMITED

Heating, Ventilating and Electrical Engineers

Works and Head Office
TROWBRIDGE

Also at LONDON, MANCHESTER, BIRMINGHAM, GLASGOW, DUBLIN, LINCOLN, BRISTOL, BOURNEMOUTH, NEWCASTLE, TORQUAY, LIVERPOOL, EASTBOURNE

Before you buy your coke

CONSIDER OIL!

Weigh up oil heating against coke—and oil wins every time! Fit a Parwinac Automatic Oil Burning Heater to your present system—you'll be amazed at its convenience; cleanliness, and efficiency. No stoking, no dirt, no odours—just switch on, that's all. Send name and number of your present boiler, with maker's name and ask for fully illustrated Brochure O.B.117.

OBY

PARKER, WINDER
& ACHURCH, Ltd.,
Heating Engineers,
BIRMINGHAM.

London: 4, Gt. Marlboro' St. W.1. Manchester: 16, John Dalton St. Leicester: 64, London Road.

Parwinac OIL HEATER for AUTOMATIC CENTRAL HEATING

TELEGRAMS: "WALSH'S, 430 BOLTON"
TELEPHONE: 430

ROBERT WALSH

(ROBERT WALSH)

M.I.H. & V.E. M.I.P.

PLUMBERS, HEATING,
LIGHTING AND
VENTILATING ENGINEERS

FIRE ESCAPES, APPLIANCES,
HOSE REELS, &C., &C.

DAUBHILL, BOLTON

rendering abatement increasingly easy, and, while it may not yet be practicable to reduce smoke emission to entirely negligible proportions, it can be stated that if all the progress so made was utilized to the maximum economic extent, there would be an immediate marked improvement in the state of the atmosphere. There is no longer any excuse for burning coal uneconomically, and for thus producing smoke, and this, together with the methods available of utilising such mediums as gas, electricity, oil, pulverised fuel and smokeless solid fuels, including carbonized coals, anthracite and steam coals, means that there is sufficient choice to render, for the great majority of requirements, smokeless conditions both practicable and advantageous.

The greater part of the coal used for industrial furnaces is for the purposes of steam raising, and, except in certain well-defined districts, the smoke produced from boiler furnaces constitutes practically the whole of the problem.

The causes of smoke produced in this way are many, but may be classified as follows :—

1. Inadequate plant, necessitating continuous or occasional overloading.

2. Inefficient or ill-equipped plant.

3. Plant unsuitable for the requirements, or fuel unsuitable for the plant.

4. Unskilful, negligent or otherwise incorrect firing.

It is impossible to state definitely in what order of frequency these factors exist, and in many cases it will be found that they are all present in varying degrees. While the figures are given only as an example, it is interesting to note that in 73 proved smoke offences in an industrial city the causes were classified as follows :—

Insufficient draught	27
Neglect or careless firing	24
Unduly restricted draught	9
Defective condition of mechanical stokers ..	5
Insufficient furnaces at work	4
Excessive duties of firemen	2
Defective flues	2

The remedies are obvious, and, put in a form which should, but too frequently does not, receive the attention of the management, are :

1. To provide, when ever possible, steam raising plant that will easily meet the maximum demand that is likely to be put upon it, and to ensure that such plant is of the type best fitted for the particular work it has to perform.

2. To keep all plant in good repair, especially with respect to sources of heat loss, and to equip it with such instruments as are required to provide full data for observing and maintaining the maximum efficiency.

3. To ascertain the most suitable fuel and to adhere constantly to it.

4. To realize how much depends on the firemen when hand firing is used, and that even with mechanical stoking a great deal rests with the individual in charge, and, therefore, to employ skilled men and to pay them at a skilled labour rate.

5. In general, to remember that the boiler house is an integral and fundamental part of the manufacturing process, and that its efficiency is as important as the efficiency obtained in the engine room, or at the last stage, in the sales department.

6. To discontinue the use of raw coal wherever it may be economical to do so, and to substitute the smokeless medium which will give the most satisfactory results.

Much more might be said on these points, but the brief summary will serve to indicate the lines of action. The remedies are there, but a visit to any manufacturing district will immediately show that they are not acted upon, and yet it will not be denied that if they were considered smoke from steam raising processes would be reduced to negligible proportions. This is the view taken, without qualifications, by the Committee on Smoke and Noxious Vapours Abatement, in its final report (1921) :

" The evidence shows that under normal conditions, and with careful stoking, either mechanical or by hand, little or no smoke need be produced by boiler furnaces, and that in many cases it would be quite practicable, without undue expenditure, very largely to reduce the amount of smoke at present emitted.

" The large amount of evidence which we have received to this effect has been confirmed by the interviews which we have had with various manufacturers and works managers on the occasion of our visits to manufacturing districts."

In view of these considerations it is necessary to consider the factors which are obstructing the methods which are available. Again making use of a convenient tabulation, these may be stated as :

1. From a purely " smoke abatement " point of view there is still a lamentable apathy on the part of many industrialists towards the serious consequences of the emission of smoke, not only as it affects the community, but also as it affects them. In a recent valuable article (9) Mr. J. B. Jones gave the results of a questionnaire addressed to the surveyors of one of the leading boiler insurance companies. The first two questions asked whether power plant owners, engineers and boiler attendants showed any increased desire to abolish smoke, and if so whether this was due to increased regard for the public welfare, or to the fear of being brought before the magistrates. The replies were summed up, and showed that, with few exceptions, little interest was shown, and only fear of prosecutions prompts any serious attempt to combat the nuisance.

2. The unwillingness of manufacturers to consider even small improvements and modernizations of plant in a time of continued industrial depression. While in many cases this is a valid excuse, it is certain that only too frequently it is a question of false economy. There is no need to stress the ultimate saving, through increased efficiency and lower fuel bills, which will result from carefully planned improvements.

3. The extraordinary unconcerned attitude of many manufacturers towards the state of their boiler houses. The emission of smoke is only the visible sign of wasted fuel, higher costs, lower output and general inefficiency. One illuminating example may be quoted as typical of many. It is from the statement of the manager of a mill with respect to alleged black smoke emission :—

" They had an 1874 engine, and had it modernized 34 years ago, but the structure was still there. They were burning on an average 74 tons of coal per week, and they ought really to burn no more than 54 tons. They were burning 18 to 20 tons more than they ought to each week."

4. Coupled with the above there is, with those directly concerned with the plant, a general lack of interest in the use of the best technical methods and of fuel economy. A further query in the questionnaire just mentioned was :

" Have you noticed any marked improvements in the general knowledge of engineers and boiler attendants regarding the principles of efficient combustion which lie at the root of the matter ? " The replies " show that in very few districts is there any evidence of marked improvement in the knowledge of boiler attendants regarding the principles of efficient and, therefore, smokeless combustion. In very large plants employing skilled and trained engineers there is undoubtedly some improvement, but this is due largely to the imperative demand for fuel economy."

5. The low status of the boiler attendant or stoker, who is frequently employed with but little regard for training or knowledge, other than that of the bare mechanical operations. This point was considered very important by the Committee on Smoke and Noxious Vapours Abatement, and a whole paragraph (75) is devoted to it in the final report. They state that " stoking should be regarded as a skilled trade, and paid as such."

There is one important aspect of this subject which required further comment, and that is the problem arising from an intermittent load. This is a common source of trouble from steam raising plants, and there are considerable difficulties in ensuring that no smoke will be emitted when sudden increases of load are called for. An alternating very low and very high load renders complete control of steam pressure and fire conditions almost impossible. The difficulty is probably best overcome by the use of steam storage methods, but here again there are sometimes difficulties, especially difficulties of space and finance. It is interesting to note the statements made at the Bradford Inquiry of 1929. This inquiry, held by the Ministry of Health, arose out of the opposition of certain manufacturing interests to the proposed new byelaws that were being applied for corporately, by a number of the West Riding of Yorkshire local authorities.

The case for the manufacturers was eventually narrowed down to the question of intermittent demand, as in many of the establishments which would be affected by the byelaw large quantities of steam were required for process operations at times which could not be accurately anticipated. Apart from this special case the manufacturers appeared to accept the fairness of the byelaw with respect to steam raising in general.

Furnace Operations.

The problem of smoke abatement in furnaces used for metallurgical and other processes, such as the reheating of steel, brick making, lime burning, and the like, is far more complex, and affords no easy solution. On this side there are many totally different operations, necessitating totally different practices, so that it is impossible, in a general paper, to give the detailed survey which is called for if the discussion is to be of any value, and if platitudes are to be avoided.

Further, each case which is liable to cause a serious smoke nuisance is a more or less specialized process, to deal carefully and adequately with which can only be done by a technologist well acquainted with every detail and every requirement of this particular process.

In general, progress on these lines, from the smoke abatement viewpoint, can best be achieved :

(a) By forming a strong public opinion against smoke pollution so that the industries concerned will be forced to examine their own particular problems with greater care.

(b) By doing all that is possible to encourage research, demonstrate improvements, and generally to persuade manufacturers to look upon the problem as being both important and urgent.

(c) Through legislation and the action of local authorities to induce manufacturers to utilise the best means possible, and which have been proved satisfactory in similar circumstances. While the outside administration is probably unable to determine the standard to set, it can use its powers to induce others to attain the standard already achieved by those who have tackled their particular problem most thoroughly.

The value of a public opinion here, and also in the case of steam raising processes, does not lie in that it can cause an immediate reduction in smoke, but that it can bring about a realization that the problem must be considered, and can set revolving the wheels of investigation, which will result in improved mothods of working.

Legislation : Its Scope and Limitations.

The nuisance, being a national one affecting everyone—there is probably no one in the country who would not benefit, directly or indirectly, from its abolition—and especially as a matter concerning public health, is one that can and must be dealt with by legislative means. Though the earliest enactment against the emission of smoke apparently came into force in 1273, it was not until 1875, as part of the great Public Health Act passed that year, that a comprehensive statute was brought into being. That Act is in force to-day, and the smoke abatement sections have not been displaced, but only amended and extended by the recent Public Health (Smoke Abatement) Act, 1926.

Of the legislation existing at present two things can be said. Firstly, that it is in many ways inadequate, and secondly, that what is valuable is inadequately used.

One of the reasons why the law is inadequate is the presence of technical difficulties of definition and description, real or imagined, and a further reason is that compromise has always to be made with those who are opposing the measure.

Opposition to such legislation is generally forthcoming from those who will be penalized, and it is but natural to expect this. If no one objects the law will probably be entirely useless, and similarly, and if the standard laid down by the law is not in advance of that of the majority there will be no beneficial results achieved. The use of coercive measures always arouses criticism and the feeling that it would be preferable to use more persuasive powers instead. Persuasion may lead to improvement, and it may be said quite definitely that those connected with the smoke abatement movement would prefer such means. But unfortunately, this is not possible, and public opinion without the backing of penalties would be effective with only a very small minority of manufacturers. A well-known smoke inspector has recently said of the city in which he has worked, " I would like to be able to say that I thought the average manufacturer was amenable to persuasion, but I am afraid that if the Public Health Committee had relied on this, the results would have been very meagre. The great majority of manufacturers, unfortunately, will not trouble themselves unless compelled to do so." He added that he did not think that an organization on the lines of the Hamburg Smoke Abatement League (Verein fur Feuerungsbetrieb und Rauchbekampfung) would have worked in this country. (11).

It is not possible to consider the existing legislation in any comprehensive way at the moment, but one or two points of special interest may be mentioned.

Action may be taken against any offender for any type of smoke (including soot, ash, grit and gritty particles) if the prosecuting authority can prove that a nuisance has been committed. In the 1875 Act this was confined to black smoke only, but the new Act extends it to any smoke, " notwithstanding that the smoke is not black smoke." A conviction cannot, however, be obtained for smoke other than black unless the offender cannot show that " he has used the best practicable means for preventing the nuisance, *having regard to the cost and to local conditions and circumstances*."

The burden of proof will remain with the authority until a standard of what constitutes a nuisance is laid down and fixed by a byelaw. Such byelaws may be framed by the local authority, but have to be approved by the Ministry of Health, which generally suggests model byelaws for the guidance of the authorities. Although the Act came into operation in July, 1927, no model has been drafted by the Ministry of Health, and no authority has yet submitted a byelaw which will meet with the Ministry's approval. So far, therefore, this section of the Act is useless.

The Ministry of Health has, however, drafted a model byelaw for black smoke, in which it is suggested that the standard of emission should be " . . . black smoke for a period of two minutes in the aggregate within any continuous period of thirty minutes from any building other than a private dwelling house." The vital difference between this and the section in the Act is that in this case the emission " *shall until the contrary be proved be presumed to be a nuisance*."

By means of this procedure is being made more standardized throughout the country, but similar, or even more stringent regulations have been in force in many areas since the 1875 Act, that actually there is but little advance. Further, although a time limit of two minutes in the half-hour is laid down in the Ministry's model, in many cases where the byelaw has been applied for the limit has been increased to a period of three minutes, the extension being mainly a result of opposition furthered by manufacturing interests. This is the case with the London County Council byelaw.

While these byelaws are undoubtedly of some importance, they are of nothing like the value of those which, to quote the Act, will " regulate the emission of smoke of such colour, density or content as may be prescribed by the byelaws." The blackness of the smoke is itself of secondary importance, and coloured or grey smoke may be of greater detriment. At last, however, steps are being taken by the Ministry of Health to endeavour to arrive at some standard, and to this end the Ministry has invited the Department of Scientific and Industrial Research to supply reliable information concerning the use of optical methods for estimating the solid contents of emissions from industrial chimneys. The Department is therefore developing the experimental work in progress at the Fuel Research Station at Greenwich. The work is of considerable difficulty, and the chief trouble is to co-ordinate the many variable factors which are present in any quantitative visual estimation of smoke. Until a standard has been obtained which will induce the Ministry of Health to issue model byelaws or to approve of those presented by local authorities, this section of the Act, the most useful one of all, is of no practical value whatever.

The freeing of the gas industry from the antiquated shackles which still hamper it, and the consequent increase in the value of the service that can be rendered as a result, will be welcomed by all interested in smoke abatement, as will the completion of the national electricity scheme, as a result of which it is hoped that there will be a substantial decrease in the cost of electrical energy. While in many districts the cost is already at a figure which makes its general use possible for the average household, there are others in which the charges are prohibitive except for very restricted use.

The Problem of the Open Fire.

The use of electricity and gas is destined to increae considerably, but, apart from the question of cost, these mediums alone cannot achieve a complete abatement of domestic smoke. The demand of the British public for the open fire is as strong as ever, and there is no possibility, in general, of this demand disappearing. The problem is of great interest. Why, it may be asked, should there be such a strong prejudice in favour of the open fire in this country, to an extent probably greater than in any other land ?

There is possibly some definite radiation or other quality in the type of fire of which that using bituminous coal in an open grate is the most widely known, which has some actual physiological action upon the body, or, on the other hand, the main factor may be purely psychological. The latter is perfectly understandable when it is remembered what a large part is played by fire, the source of heat and comfort, in the lives of a people dwelling in a climate which necessitates artificial warmth during the greater part of the year, and which, in addition, is subject to frequent rainy and lengthy damp periods. Many thousands of dark and cold winters have been rendered tolerable to our ancestors only because of the indescribable joy of fire, with its glowing embers and leaping flames, and it is only natural that we, in spite of our more sheltered conditions, should have inherited, from such sharp and pleasurable experiences, a similar complete and ineffaceable delight in, and prejudice towards, the open fire.

The open fire also provides an excellent and healthy method of ventilation, a factor which must be carefully considered in living and other rooms occupied for long periods, and, further, provided a rapid and sanitary method for disposing of household refuse. It will, perhaps, not be out of place to mention the real value of the open fire to the pipe smoker ; and even the nervous recipient of amatory correspondence might claim consideration.

In spite of these advantages the open fire stands condemned for its inefficiency, and for its quite unavoidable smoke production. The solution of the problem is dual—to restrict the open fire to those uses where its peculiar advantages make it desirable—popularly expressed, to fires used for sitting in front of—and to use in them smokeless solid fuels which will answer all the purposes of soft coal.

Solid Fuels.

Much interest is concentrated to-day on the possibilities of the various types of smokeless solid fuel. Graded steam coals, anthracite, gas and oven coke, and low temperature semi-coke are the available materials, and in these there is everything needed to supplement electricity and gas in the total abolition of domestic smoke. The fuels fall into two different categories ; those which can replace soft coal with certain success in every type of grate, kitchen range or stove, and those which need special or adapted appliances to obtain the best results. In the latter class there is already a wide and growing use of the natural hard coals and of high temperature cokes, in domestic boilers, central heating plants and in the excellent new types of specially designed open fires, many of which are fitted with gas burners for ignition purposes. Probably the cheapest way of obtaining, with one fire, hot water, limited central heating, and cooking requirements, is with the well-known combined range using any kind of suitably graded coke or anthracite.

The final point to be considered is of extreme importance—that of the supply of a smokeless fuel which will equal coal in every respect, and which must be sold at a similar competitive price. Onc of the most important aspects of this domestic smoke abatement problem is that of making smokeless the innumberable small houses of every town and city, including the actual slums, where the price of gas and electricity is either wholly or partially prohibitive, and where there are no chances, except under some subsidy arrangement, of altering existing fireplaces and ranges to permit the use of such fuels as anthracite and hard cokes. Such areas of small houses and tenements are generally huddled together over a large area, and their combined chimneys, each in itself almost negligible, create a vast and concentrated pall of high tar-content smoke. Our large towns will never be smokeless until these houses can be supplied with a suitable fuel, at a price no higher than that of low grade household coal, and which can be obtained easily and in small quantities at a time. It must be stressed that in these homes, and, indeed, in the majority of middle-class homes as well, the true cost for heat obtainable will not be considered to any appreciable extent, or at any rate only as a secondary factor. Even though it is scientifically erroneous, the deciding factor, above all others, will be the *price per hundredweight*.

The fuels which can render this possible are low temperature and certain classes of high temperature cokes. The production of low temperature fuel for domestic purposes is, of course, only one aspect of the complete technical and commercial success of this method of carbonization, and must depend very largely upon the profitable disposal of the other products and upon the economic stability of the process or processes as a whole. From the smoke abatement point of view, however, the price and quality of the solid fuel are the deciding factors of its success. The price, up to now, is low enough to obtain a limited, even though still unsaturated market, but it is still far from being competitive with the cheaper grades of coal.

With respect to quality and general performance in the open grate, low temperature cokes have, and are being, produced, which are in every way excellent and leave little to be desired. Two practical points of importance, which apply also to other cokes, may be mentioned, as apparently they have not been considered to the necessary extent by those concerned. The ash in a carbonized coal is more flocculent and bulky than that derived from an untreated coal, and, apart from the ease with which it will fly about the room (a further point requiring examination) appears to be greater in quantity than it actually is. Thus, to the housewife, a carbonized fuel containing, say, 10 per cent. of ash will appear to be "dirtier," as she will express it, than a coal containing a like amount. There is no doubt that many people using such fuels for the first time have been permanently prejudiced against them because of what they have considered to be an excessive quantity of ash. The remedy is to supply fuels which actually have an ash content as far below that of the average household coal as is practicable. Only by such means will the fastidious user be satisfied. The second point is that carbonized fuels, probably owing to their cellular structure, absorb and retain moisture in a way that war coal does not. The fuel is then unpleasant to handle, difficult to ignite, and burns dully. Here, again, the delivery of such a fuel is likely to create prejudice against it, especially when it is being tried for the first time, which, if its use is to increase, must be so in a large number of cases. Shelter during transport and storage, although perhaps troublesome, seems, therefore, to be necessary.

With respect to gas coke there is much requiring to be done. Nearly all grades of such fuel have greatly improved upon that produced some years ago, and that of many gas undertakings, especially from vertical retorts, is consistently excellent for household purposes, being clean, dry, low in ash and high in calorific value and radiant efficiency. Such high quality coke can be burned successfully in many ordinary open fires, in addition to those specially designed for its use, but it is not unfailingly successful. But by the blending of suitable coals, and, if necessary, by controlling the distillation so that the coke retains a slightly higher percentage of volatile matter, a high temperature coke can be produced which is equal, or nearly equal, to the best low temperature fuels. That is, it will ignite without difficulty, give a cheerful and lasting fire, and remain burning in even a low fire. Such cokes can be sold at low prices, and can be properly distribud through the organization which every gas undertaking has. However, with a few notable and commendable exceptions, little has been done in this direction, for the gas industry, on the whole, looks upon the product which contains 45 per cent. of the thermal value of the coal it uses as of little importance. The industry has done much for smoke abatement in one direction, and there is here the opportunity for it, in another direction, to do much more.

Oil.

Mention should be made of the importance of oil as a fuel assisting smoke abatement. Apart from its industrial uses for power production, it is of considerable value in the central heating of larger houses and city buildings. The convenience of storage, automatic and thermostatically regulated feed, entailing the minimum of attendance, makes this fuel, in many cases, very suitable for the heating of buildings. The oil stove is a useful appliance for auxiliary local heating, and the modern oil cooker is an excellent product.

This brief survey of the domestic question shows that all available methods have their value and have their own part to play in abating the nuisance. The cheapening of gas and electricity, and extended use of solid fuels for use in the special grates, and the supply of a low-priced good quality fuel, competitive with coal in every respect, and capable of being burned in every grate or range, are the outstanding needs. Beyond these things, and required by them for their rapid development, is the necessity for making the public realize that smoke is a thing which is in every way evil, costly and stupid ; that is largely occasioned by them ; that it should be a recognised civic obligation not to produce smoke ; and that smokeless methods will pay them in every possible sense.

It will have been seen that a considerable diminution of the smoke nuisance is possible at once, and that still further progress will be achieved when efficiency and fuel economy take their proper place in every industrial establishment, and when the domestic demand can be satisfied more completely by the several smokeless mediums, which are, in varying degrees, already available. There has been a fair amount of progress during the last quarter of a century, and an appreciable improvement has been effected, but the rate must be greatly accelerated before the efforts which are being made can be slackened. Indeed, the most urgent need at the present time is for those efforts to be increased and made much more effective than they have been in the past. One of the greatest stumbling blocks of all has not yet been mentioned, and this is the apathy of nearly everyone to what is undeniably a grave problem. This inexplicable indifference must be overcome, and the pressing need is for education, publicity and propaganda of every possible kind. The facts are there, but they are not known. They must be brought persistently and clearly before the public and the manufacturers; before Parliament, every municipal council and every health committee. Only by such means will the nation be brought to realize the desirability of abolishing smoke, and until this happens, and the realization is followed, as it would be, by a demand for, and accomplishment of, reform, abatement will continue to be imperceptibly slow, and a complete cleansing of the skies nothing but a vain and infeasible aspiration.

REFERENCES.

(1) Bone, W. A. Coal and Its Scientific Uses.
(2) Shaw and Owens; Cohen and Ruston, etc. Baines, Sir F. Manchester Smoke Abatement Conference, 1924.
(3) Cohen and Ruston. "Smoke."
(4) Taylor, J. S. "Smoke and Health," and numerous papers.
(5) Committee on Smoke and Noxious Vapours Abatement, Final Report (1921).
(6) Royal Commission on the Coal Industry (1925).
(7) The Investigation of Atmospheric Pollution, 17th Report.
(8) Shaw and Owens. "Smoke Problem of Great Cities," etc.
(9) Jones, J. B. Journal National Smoke Abatement Society, I.3.
(10) Oldham Chronicle, 29.8.30.
(11) Rowe, R.M. Journal National Smoke Abatement Society, II.5.

Smoke Abatement and the Agriculturist

LORD HAREWOOD'S INDICTMENT.

Lord Harewood, opening the great new Kirkstall Power Station at Leeds, in his speceh at the luncheon held in conjunction with the ceremony, said: "There can be no doubt that the industrial developments which have led to the prosperity of our great cities have caused such a pollution of the atmosphere that the health of the nation has been more than slightly affected by it. I go so far in my own personal view, though, of course, I am not a doctor, as to say that the good which is done by the clearance of slum areas is no greater than the good which would be derived by clearing the atmosphere from the charge which it carries of smoke, chemicals and other defilements."

The smoke nuisance, he continued, was not singular in any sense to Leeds, but common to the whole industrial area of England, and affected a far greater part of the country than people realized. The winds that blew from the great cities made it difficult for farmers within the areas swept by them to keep the grass sweet and fit for cattle. He would add at once that, although he was a near neighbour of Leeds, he did not blame the city for such sourness as he, as a landowner, had got on the grass of his own land; he blamed cities which lay much further off.

He hoped that by the development of cheap electric power mass production would be carried on without pollution of the atmosphere.

Correspondence

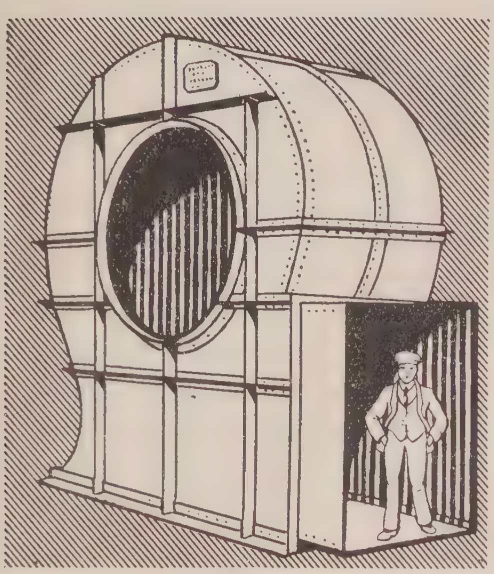
Statutory Committees.

The Editor, J.N.S.A.S.

DEAR SIR,

I was interested to see the comments of Mr. Councillor Asbury of Sheffield, and Mr. Rowe of Manchester, in your last issue, relative to my previous letter upon the above subject. If my critics will refer to my letter again they will find that I do not state that I am opposed to the formation of Statutory Committees for dealing with the smoke nuisance under any circumstances, but that in my opinion they will not *ipso facto* prove to be beneficial in all cases. I must confess that I am still of that opinion.

Whilst Councillor Asbury evidently agrees with my first contention that the size of the contemplated area is a very material factor, he does not give us much information as to how the ideal is to be arrived at. I entirely agree with the statement that we live in a specialist age and have sufficient knowledge of the duties of a Sanitary Inspector to need no reminder of their multitudinary nature. If we have to take this as a serious reason for the setting up of Statutory Committees however, it is probably equally necessary in regard to other matters than smoke. Are not specialist



‘CYCLONE’ FANS

for induced draught

INDUCED draught for Steam Boilers offers innumerable economies, and to prefer the “Cyclone” system of Induced Draught is the initial economy. Its scientific application of the principles involved and its reasonable cost to instal make it of first consideration.

MORE STEAM—LESS COAL—ELIMINATES BLACK SMOKE

These are the primary advantages the “Cyclone” System ensures. Saves you as much as 25% of fuel, and definitely increases boiler efficiency. New boiler houses fitted with “Cyclone” do not need tall chimneys.

Write for explanatory Booklet 66 F

MATTHEWS
& YATES LTD
SWINTON MANCHESTER

©

JOHN TURTON & SONS
M. I. P.

PLUMBERS

Domestic Hot and Cold Water
Fitters in all Metals by
Smokeless Fuel, Gas or Electricity
Sanitary and Heating Engineers.

Estimates Given.

43/45, Higher Cambridge Street,
Chorlton-on-Medlock, Manchester

£100 The Subscribers hereby bind themselves to pay the above sum to the Proprietors of any steam boiler or boilers in which the Seotoo Complete Combustion Furnace fails to bring about a saving of from 5% to 25% in fuel costs, and in addition prevents the formation of smoke to the satisfaction of any Municipal or Local Regulations. Only one condition is imposed. The fuel used in the test must be about the lowest grade obtainable. For and on behalf of SMOKE PREVENTION LTD.
H. J. BULLEN, Director and Secretary,
1, Victoria Street, London, S.W.1.
Bankers: Westminster Bank Ltd.,
Caxton House, S.W.1.

inspectors already employed by many local authorities and if their number be insufficient, does it of necessity follow that additional inspectors should be employed by a Joint Statutory Committee? Councillor Asbury's assertion that a Committee having jurisdiction over the area of several local authorities will carry out its duties better and more impartially than the individual Councils, is I submit, open to doubt. It will be remembered that quite recently Mr. Morrison, Minister of Transport, stated that his experience of joint authorities led him to the opinion that there was too much "joint" and too little authority about them. On the other hand I can well imagine that County Councils will agree wholeheartedly with Mr. Asbury, and would be perfectly logical in claiming that they should take over much if not all of the work now carried out by County Boroughs. Would Councillor Asbury agree to this?

Surely Councillor Asbury's logic is at fault when he suggests that the setting up of an Examination Scheme for the training and certification of stokers and boiler attendants before there is a recognition of the fact that this is skilled work, is a case of "putting the cart before the horse." My experience of life is that the reward—if there be one—always *follows* the hard work of qualification and never *precedes* it.

Turning to the letter from Mr. Rowe I would first of all suggest to him that great improvement has been effected respecting pollution of the atmosphere by industrial smoke since the passing of the Public Health (Smoke Abatement) Act of 1926. The figures he refers to which were placed before a recent meeting of the Manchester Regional Committee are very interesting and certainly do not reflect to the credit of the Sanitary Inspectors concerned, many of whom "now possess the special certificate of the Royal Sanitary Institute for Smoke Inspectors." The inference of course is obvious, but perhaps Mr. Rowe will forgive me when I say that I do not think that Sanitary Inspectors in general will believe the case proved by these alleged results. Respecting uniformity of administration and practice, I suggest this is quite possible without the formation of Statutory Committees and in fact has been obtained within the area of the West Riding Regional Committee to a remarkable degree. As I have already suggested, smoke abatement is only one—although very important—branch of public health work. There are many others in which uniformity is very necessary. Are we to have Joint Authorities established to deal with each of these?

Finally, I do submit that the arguments brought forward up to date are not convincing proof that the formation of Statutory Committees will prove to be a panacea which will remove all our troubles respecting the administration of the Smoke Laws.

Yours faithfully,

JOHN W. BEAUMONT,
Chief Sanitary Inspector, Halifax.

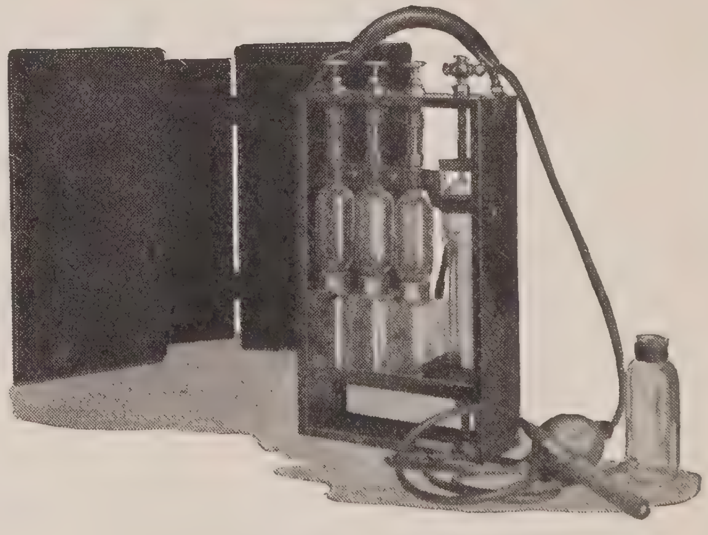
The Women's Co-operative Guild.

We are gratified at the action of the Women's Co-operative Guild in passing the following resolution at their recent Congress: "That in view of the detrimental effects of coal smoke upon the health and amenities of our fellow citizens, this Congress declares its support of a policy directed to smoke abatement, and is of the opinion that more effective steps should be taken with a view to providing suitable alternatives to raw coal for use in domestic grates. It regrets that many local authorities do not realize their responsibilities with respect to smoke prevention, and have not made use of the legislative powers they possess, and it therefore urges them to carry out these duties in a more vigorous manner, and to give active support to the regional smoke abatement committees. Further, steps should be taken to reduce the price of smokeless fuel."

"It is really as great a crime to pour poison into one's neighbours' lungs as it is to put poison in his coffee."

Frances, Countess of Warwick.

CO_2 TESTS AT THE RATE OF ONE PER MINUTE ! !



HAYS PORTABLE GAS ANALYSER.

The above analyser is still the most suitable instrument for making rapid, accurate, tests of the CO_2 percentage in flue gases. Also deals with Oxygen and Carbon Monoxide.

Full particulars from the makers

DUGUIDS LTD., LYMM, Cheshire

CLEANER CITIES

POWELL DUFFRYN SMOKELESS STEAM COALS are unrivalled for EFFICIENCY, ECONOMY and CLEANLINESS.

There is a SMOKELESS COAL for every use :—
Power Stations, Industrial Plants, Institutions, Laundries, Steam Lorries, etc.

P.D. Smokeless Steam Coals have a very low sulphur and ash content, with a high percentage of fixed carbon.

They are eminently suitable for use in modern mechanical stokers.

BRIGHTER HOMES

PHURNOD SMOKELESS COAL is suitable for all types of domestic hot water boilers, central heating plants, slow combustion stoves, kitcheners, etc.

PHURNOD makes no soot, possesses great heat value, and is the most economical fuel obtainable at its price.

PHURNOD is obtainable in 3 sizes for various requirements :—

No. 1. Cobbles, for horticultural use and the larger central heating plants.

No. 2. Large Nuts, for the larger type of domestic hot water boilers.

No. 3. Small Nuts, for the smaller type of domestic hot water boilers, slow combustion stoves, kitcheners, etc.

For further particulars apply to :—

STEPHENSON CLARKE & ASSOCIATED COMPANIES LIMITED

4, ST. DUNSTAN'S ALLEY, LONDON, E.C. 3.

And at :—Cardiff, Southampton, Birmingham, Nottingham, Liverpool, Hull,
Newcastle-on-Tyne, Glasgow, Belfast.

FOR

SMOKELESS

STEAM RAISING, CENTRAL HEATING, HOT WATER SUPPLY

BY

PRODUCER GAS FIRED BOILERS
OIL FIRED BOILERS
ELECTRO THERMAL STORAGE

and all Modern Methods consult

SAUNDERS & TAYLOR LTD.

ENGINEERS

Praed Rd. Trafford Park,
MANCHESTER.

118-122, Holborn,
LONDON, E.C. 1.

LET US ADVISE YOU ON ALL YOUR PROBLEMS OF

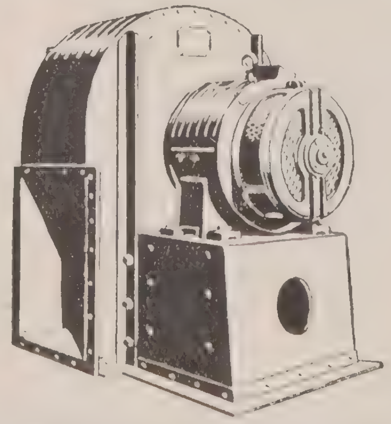
VENTILATING

DUST REMOVING, STEAM REMOVING, REFUSE COLLECTING, INDUCED DRAUGHT AND HEATING, Etc.

EXPERTS IN THE DESIGN, CONSTRUCTION AND APPLICATION OF FANS FOR ALL PURPOSES

▣

Telephone: 6024 CITY



THE "BRADSHAW" ELECTRIC EXHAUSTER

SCHEMES AND ESTIMATES FOR COMPLETE INSTALLATIONS FREE

Efficiency Guaranteed

▣

Telegrams:
"Exhauster, Manchester."

CALL WRITE OR 'PHONE

The Bradshaw Fan & Ventilating Co., Ltd.

134, DEANSGATE, MANCHESTER.

The Journal of the
National Smoke Abatement Society

(The Official Quarterly Organ)

Editor: **Arnold Marsh, M.Sc.Tech.**

Editorial Office:
23, King Street
Manchester
Telephone: Central 1218

Advertisement Office:
The Service Guild
45, Deansgate Arcade, Manchester
Telephone: Central 1165

The Journal of the National Smoke Abatement Society. Vol. 2. No. 8.

CONTENTS OF AUTUMN ISSUE

	Page
Commentary	79
A Survey of the Smokeless Solid Fuels— iv. Coke produced in the Bye-Product Coke Oven, by G. E. Foxwell, D.Sc., F.Inst.P., F.Inst.F.	81
Correspondence— E. B. Hocken and W. Luckhurst	85
The Liverpool Conference	86
The Progress of the Electrical Grid, by R. Blackmore, M.I.E.E.	89
Public Health and Smoke Abatement	94
The Smoke Abatement Handbook	94
News and Notes	94

COMMENTARY

THE report of the Society's Conference in the Liverpool "Daily Post" was headed "Liverpool Not a Smoky City." Certainly Liverpool is not as smoky as some of her neighbours, but one doubts whether many of the hundred delegates who attended the Conference would have agreed that Liverpool could include smokelessness among her most noteworthy civic amenities. Quite apart from factory smoke and the special problem of steamship smoke, it is obvious that a city of a million inhabitants cannot, while raw coal is used in the domestic grate, pretend to be anything but smoky. Liverpool, however, seems to possess to a notable degree that admirable sense of civic responsibility and co-operation, so that when a problem is tackled it is tackled vigorously and effectively. We hope that our Conference, in addition to its general value, will prove to have been a stimulus which will induce Liverpool to attack this evil in the way that Liverpool can. If only for the sake of that beautiful Cathedral, already blackening and doubtless showing signs of corrosion, it would be well worth doing; but, of course, there are things even more important to the city than that great edifice.

* * * * *

Elsewhere in this issue will be found information concerning our recently published "Handbook." There is in existence a surprisingly large amount of data on the various aspects of smoke abatement, and there are several excellent text-books on the subject; but there has been a need for a concise and yet adequate reference book for the use of all those who, for speaking or writing, require information. In addition the Handbook will assist smoke abatement because it can also be regarded as an unusually comprehensive and detailed propaganda pamphlet. There are still a considerable number of copies to be disposed of, and we should be grateful if members would co-operate with us in ensuring that every copy finds its way into the hands of someone who will make good use of it.

Twelve months ago we commented upon the claims put forward in a coal-merchant's price-list with respect to the superiority of bituminous coal for domestic purposes. A further brochure entitled "Coal Fires will be Preferred this Winter," has come into our hands. It commences by saying that "The coal fire, universally admitted to be the most cheerful warmth, is objected to by some because of smoke and daily lighting." It continues by claiming this to be unjustified because anthracite coal is quite smokeless. It certainly is, but unfortunately its consumption for domestic purposes is extremely small, and in any case it is in a distinctly separate category from the widely-used smoke-producing bituminous coal. The implication made in this statement is obviously illogical. The virtues of coal are then shown by adverse criticisms of the smokeless mediums—gas, electricity and oil. Electricity is dismissed as a luxury and deprecated because of maintenance costs and because failures of supply have been known. Gas also "is conveyed through pipes, which are costly to lay and to maintain, thus the heat from the gas must cost a great deal more than the heat from the coal." Further, "it is unwise to use gas without a properly constructed chimney because the products of combustion (Carbon monoxide) are poisonous." This is just nonsense; for it is equally unwise (and even impossible) to use coal without a properly constructed chimney. The statement regarding carbon monoxide is both ungrammatical and untrue, and clearly shows the cheap nature of the propaganda. Oil is condescendingly referred to as being "sometimes a useful fuel in ultra-rural districts."

* * * * *

We will give the leaflet its small due and say that it is largely concerned with the advocacy of the use of stoves and ranges, which, if and when they burn the smokeless anthracite, anthracitic coals, or coke, are commendable. It is regrettable though, that what good might have been done for the smokeless coals has been more than lost by the uncalled-for attack upon smoke abatement generally. The one point of real interest about the leaflet is that it is a sign of the times—a sign that the throne of Old King Coal is tottering. It shows that the growing movement of smoke abatement is beginning to be taken seriously by the coal merchants. But as we have said before, there is no need for opposition of this kind; the far-sighted policy of the coal merchants is to encourage the use of smokeless solid fuels, of which he may, if he wishes, become the future purveyor.

* * * * *

Further information has been received respecting the Meuse Valley tragedy of December last. It has now been confirmed that the sole cause of the "poison fog" was the presence of sulphur dioxide (with possibly small amounts of other irritant substances) emitted from the works in the valley. There was no abnormal emission of fumes: the only abnormal features were meteorological—dense fog, absence of wind, and high atmospheric pressure over a period of several days. As far as can be ascertained the impression seems to be that conditions are quite harmless while the atmosphere is normal, and that the action to be taken should be concerned with warning the district of the danger whenever a recurrence of the abnormal conditions seems likely. Such a step would undoubtedly be valuable; but unless it is accompanied by very thorough action to reduce the emission of the fumes, it seems to be avoiding the real question. If the fumes are able to cause death during foggy periods, is it not obvious that ordinarily they must have considerable adverse, althought perhaps not fatal, effects upon the health of the inhabitants of the area? Not being in possession of all the details of the case we are not competent to express an opinion upon the methods that should be applied to prevent a further disaster. One thing, however, is clearly proved, which applies to this country as much as to Belgium—that the danger from sulphur dioxide is not a bogey, but is, in all soberness, a very real and considerable matter. It reaches its maximum effects during fog; but it is at work at all times.

* * * * *

That there were 2,320 convictions in Liverpool last year for the offence of firing chimney flues will not surprise anyone who has been concerned with conditions in the large towns and cities. Liverpool's total could—or at any rate, should—be equalled by any other comparable city. Even though its results are serious and constitute no inconsiderable part of the harm and damage caused by domestic smoke, it is in itself a mean kind of nuisance which reflects an absence of communal responsibility and neighbourly consideration among those who commit it. The fines inflicted are only small and the housewives responsible seem to consider the risk worth while. We have noticed a self-conscious stir in the audience when condemning the practice at meetings composed of women who should have known better. For the sake of a few coppers every now and then thousands of housewives prefer to continue one of the most unnecessary and stupid nuisances there is. Educational work and forceful propaganda against the habit need instituting in our towns—an excellent opportunity for further good work among the influential women's organizations. A campaign has been instituted in a Manchester district, about which we hope to be able to give some details in a future issue.

A Survey of the Smokeless Solid Fuels—

IV. Coke Produced in the Bye-Product Coke Oven.

By G. E. FOXWELL, D.SC., F.INST.P., F.INST.F.

Earlier contributors to this series have explained the particular use of the fuels about which they have written and have given their analyses and other important characteristics. The present writer proposes to take a rather different line because the smokelessness and suitability for very many purposes of by-product oven coke cannot be questioned. The greater portion of the coke produced in by-product ovens is used for pig-iron manufacture in blast furnaces, and it is only the smaller sizes which are screened off for sale in other markets. A few works break up some of the large coke and make a speciality of graded coke, but, in general, oven coke supplied to the public is the smalls produced in ordinary operation. It has the advantage over most other cokes of possessing a lower ash content since it is made from washed coal. Being carefully sized to suit customers' requirements it is very suitable for any purpose for which gas coke is used. These purposes were admirably described in Mr. E. W. L. Nicol's article in the previous number of the journal.

The text around which this article is written is the economic possibilities of the by-product coke oven in contributing to the solution of the solid smokeless fuel problem. At the outset, however, it is well to point out that by-product oven coke as now manufactured is not a standard uniform article and its properties can be varied by adjusting the conditions. Ignitability and combustibility of oven coke for example, depend upon many factors. The time during which the coke has remained in the oven and the temperature to which it has been heated there are very important. The combustibility of oven coke is noticeably greater if it has not been heated to a temperature higher than, say, 800°C. or 850°C. than when it has been heated to greater temperatures. The time factor is also of importance. A short heating at 900°C., for example, may actually produce a more combustible coke than prolonged heating at 800°C. The combustibility of oven coke as now produced is, in general, rather less than the combustibility of gas coke, although this statement is not universally true. The nature of the coal affects the combustibility of oven coke profoundly. Some coals yield a coke containing a very high development of exceedingly minute pores. The existence of these pores can be ascertained by the relative ease with which the coke absorbs carbon dioxide, in a manner exactly similar to the absorption of easily condensable gases by charcoal. Cokes possessing this structure are always combustible. If the operation of the oven is so regulated as to leave an average of 3% or 4% of volatile matter in the coke, there is also an increase in combustibility. For these reasons, whilst the oven coke as at present produced is not of a highly combustible nature, it is quite feasible without making any fundamental alteration to the structure or operation of existing by-product coke oven plants to produce a coke considerably more combustible than that produced to-day.

The Price Factor.

The smokeless fuel problem, in the writer's opinion, will never be solved by education of the people alone. This may seem to the members of the National Smoke Abatement Society to be a discouraging statement, but it is necessary to face economic facts. It may be true that smoke costs the nation £80,000,000 a year. It may also be true that we are suffering heavy toll and disease and ill health through smoke, but the average householder, although fully aware of these facts, will not be aroused to action by his knowledge and will return home to his coal fire and add his quota to the smoke. And why? The reason is a purely economic one. The average householder cannot afford to buy solid smokeless fuel. A large London stores during last winter in periodic lists issued to its customers, gave the price of solid smokeless fuel (Coalite) as 58/6 per ton and (writing from memory) quoted a similar or higher price for anthracite. Ordinary qualities of house coal, however, were only 44/- to 48/- per ton. In Sheffield, the price of coalite ranged around 40/- a ton, and good house coals could be bought at 30/- per ton.

That is one of the essential factors. Solid smokeless fuel must be as cheap as coal. Nor is it sufficient to call attention to the higher thermal efficiency of the solid smokeless fuel. The average householder will never start to try solid smokeless fuel unless its price approximates to that of coal.

But if we can secure this factor, we have still not solved the problem. The householder's wife will not try the fuel or will certainly not persevere with it unless it is as handy as coal. Low temperature fuels are nearly as easy to light as coal and the little difference that there is would not be serious, but even so for the smaller householders, the additional difficulty in lighting does add a small amount to the weekly cost of sticks or other fire-lighting materials; and in addition the fires take a little longer to burn up in an ordinary grate. Oven coke and gas coke will scarcely light at all in the ordinary domestic grate even with the expenditure of very considerable quantities of paper and sticks. They can only be used in general after the fire has been first started by coal. There are two ways of overcoming these difficulties. One is by installing a gas poker, and the other is by using special coke burning stoves. With existing fuels, it is preferable for these two means to be used together. The cost of a gas poker is not high, being only 3/3, but to this must be added the cost of fixing and piping, which will probably come to another pound. The writer ventures to suggest that there is practically no working class or lower middle class householder who will incur this expense simply to avoid smoke.

Perhaps it may seem that undue stress is being laid upon the cost, but cost, while not an essential element for people with larger incomes, is the essential factor for the poorer classes. On the hills around Sheffield on a Sunday morning, when all the industrial furnaces are silent and the industrial chimneys practically smokeless, one can see in the valleys where the houses are almost exclusively of the smaller type, a blanket of smoke so thick that even the chimneys can only be seen through it dimly. Towards Fulwood, the quarter where the larger houses are situated, the air is clear. The larger houses are so much more scattered that the intensity of the smoke blanket they produce is infinitesimal compared with that of the smaller houses. Consequently, if we are to aviod domestic smoke it is the wage earners and people with small salarles for whom we must cater.

The Ash Problem.

Finally, there is a third difficulty which is to be overcome; this difficulty applies equally to gas coke, to low temperature coke and to oven coke. Even when the householder is prepared to do all that is necessary to burn these fuels, the ladies of his household complain that they are dirty. By dirtiness is not meant the same as dirtiness with coal. A coal is " dirty " when it leaves a large residue of ash and burnt shale in the grate. A coke, however, is dirty in a different way. In making a coke, the coal is crushed to a degree of fineness such that it generally all passes through ¼in. mesh. Even finer crushing than this will probably be resorted to in the future. In the coke oven or the gas retort, the swelling of the coal during coking also causes additional movement and mixing, so that the result is a fuel in which the ash is very evenly disseminated throughout the mass in the form of very fine particles indeed. These particles remain after combustion and are so small that they are readily carried into the atmosphere by the smallest puff of air. At some period during the operation of the fire in an open grate, coke ash is carried away in this manner. If the chimney is a bad one and liable to down-draughts, this occurs during the burning of the fire, but with a properly constructed chimney, the difficulty is principally when the fire is cleaned out next morning and, however careful the cleaner may be, the furniture is covered with a coating of dust readily visible on polished surfaces. Consequently, the use of coke in an open grate gives the ladies of the household more work. The writer has known a number of households which, having burnt low temperature coke, have returned to coal fires entirely owing to this fact.

There is at the moment only one solution to this difficulty although there are others which might well be the subject of experiment. This solution is that of cleaning the coal to a high degree. Formerly, coals were not washed at all before carbonizing, but during the past twenty-five years, coal washing before carbonization in by-product coke ovens has become the established practice, although it is far from being the general practice in gas works. Recently, however, Dr. Lessing has produced a process whereby coal can be produced for carbonization at a reasonable cost, containing only the inherent ash. Ash in coal is of two kinds :—

(1) The inherent ash, which is principally the ash contained in the plants from which the coal seams were derived. No type of cleaning or washing can ever remove this, but fortunately, it is small in quantity, being sometimes below 0.5% and rarely higher than 3% of the original coal.

(2) The principal source of ash is the shale which is unavoidably taken up with the coal during mining.

With a proper cleaning plant, coke very low indeed in ash can be produced and if in the production of the necessary clean coal some intermediate product containing perhaps 10% or 15% of ash is produced, there is no need for it to be wasted as it can readily be burnt in industrial furnaces which can be fitted with proper means to prevent the ash from being discharged into the atmosphere.

Coke and Gas.

In this review of the problem of smokeless fuel, the view is taken that it is impossible to make Britain a smokeless country by legislation, because in the present state of the technique of solid smokeless fuel manufacture and use, the cost to the majority of the individuals composing the nation would be so great as to cause widespread discontent. It is unfortunately not possible to produce gas of the calorific value now declared necessary by gas engineers without at the same time producing a very much larger quantity of coke. Moreover, gas for continuous use throughout the day cannot compare with coal in price when burnt for ordinary domestic purposes. The only method at present known of producing a domestic source of heat without at the same time producing a solid smokeless fuel is electricity, but the cost of using electricity in the house is considerably greater than that of using gas and, moreover, the efficiency of the industrial processes used for the manufacture of electricity is very low indeed—so low, in fact, that it could not be in the national interest to consume coal to produce electricity for such purposes as domestic heating. There will always be an outlet for gas, but if the whole of the coal now burnt in domestic grates is carbonized, a very large quantity of gas must either be wasted or must be used by the householder. Undoubtedly, a combination of gas and coke is the ideal solution.

Unfortunately, in selling smokeless fuel the coke ovens are coming into competition with the gas companies. It is unfortunate that two great industries which are working towards the same nationally advantageous end should be in any way in conflict. Each of these industries carbonizes about 18 million tons of coal per annum and together they produce about ten million tons of coke which is sent in to the domestic market or supplied to minor manufacturers. The bulk of the oven coke, of course, is supplied to the blast furnaces and is, therefore, not included in this quantity. The coal burnt by domestic users in this country is between 45 and 50 million tons per year. That should be the market which coke ovens and gas works should set themselves to conquer, and not to compete in the existing restricted market There is consequently pressing need for co-operation.

Having now set forth the essential factors in the situation, let us consider how the by-product coke ovens can assist to solve the difficulties which confront the Smoke Abatement campaign. The by-product coke oven has the advantage over all other methods of producing coke that if its operations are on a sufficiently large scale, it can produce readily combustible coke at a lower cost per ton of coal carbonized. The first advantage of the by-product coke oven is, therefore, that of price. *Careful calculations show that it is possible to manufacture in by-product coke ovens solid smokeless fuel of a combustibility practically equal to that of exisitng low temperature fuels and to sell that product to the consumer at the same price as household coal.* This is a statement which may even surprise some workers in the coke oven industries itself. There can be no doubt, however, that solid smokeless fuel can be made an attractive proposition by producing it in the by-product coke oven. Neither the gas companies nor the operators of low temperature retorts can produce their solid smokeless fuel at this price. The gas companies because it is their primary purpose to sell gas at as cheap a price as possible, so that the coke must be to some extent a secondary consideration ; the low temperature operators because they have practically no by-products to dispose of since they recover no sulphate of ammonia and produce a tar which up to the present can only be satisfactorily used for burning.

Coke oven and colliery engineers are widely experienced in the use of coal washeries. The proper place to wash coal is at the pit head and save carriage on the dirt. The collieries are in a position, therefore, to supply the coke ovens with washed coal at the cheapest price. The importance of low ash coke has been previously explained

A National Coke Sales Organization.

When the solid smokeless fuel has been produced it is still necessary to sell it. Valuable as is the work being done by the National Smoke Abatement Society, it is the writer's opinion that an additional organization will also be necessary. The National Smoke Abatement Society has undoubtedly awakened a great many people to the necessity for smoke abatement, but more immedi-

Gas Coke saves money—

on FUEL COSTS, INSTALLATION COSTS *and* CLEANING COSTS

In the first place, Gas Coke is definitely the *cheapest* smokeless fuel . . . For Central Heating and Hot Water Supply, for Steam Raising and Oven Furnaces . . . for every undertaking, in fact, from the small Bakery to the large Power Station, where smokelessness, cleanliness *and efficiency* are essential qualities.

No fuel, however, should be judged on one quality alone—even cheapness. A fuel may be cheap *to buy*, yet need costly, specialised firing apparatus which *can* get out of order. In addition to this *initial* expense for apparatus, the user may find he has afterwards to meet frequent bills for cleaning flues, etc., with the attendant dislocation of working.

Gas Coke will burn in *any ordinary boiler*, or furnace, without smoke, without smuts, without danger. A *Coke-fired* furnace CANNOT get out of order. Gas Coke gives the maximum effective heating value, with less trouble, and at a lower cost for fuel, cleaning and general maintenance than any other *smokeless* fuel.

A *Coke-fired* furnace does not limit you to the use of one type of fuel. Gas Coke is produced from British Coal by British labour. Supplies are always available at prices which are stable and competitive with other solid smokeless fuels—and not subject to violent fluctuations through over-production or limitation of production in other parts of the World.

We invite you to explore the possibilities of Gas Coke. You need do no more preliminarily, than ask for specific instances of undertakings similar to your own which are using Gas Coke on its merits, after experience of alternative fuels. The Technical Adviser to the London and Counties Coke Association will personally investigate your special needs and advise helpfully and impartially; if your case be the occasional one where Coke is unsuitable you will be told so, frankly, and advised on alternative methods.

Write or 'phone for the new Illustrated Technical Brochure, "Smokeless Gas Coke for Central Heating and Steam Raising" free on application to:

THE LONDON AND COUNTIES COKE
ASSOCIATION
9, Grosvenor Gardens, S.W.1. (Victoria 3666)

Gas Coke is *smokeless, cheap & clean*

COKE FIRES

Smokeless
Labour-Saving
Economical
Attractive.

Write or Telephone to :-

C. H. Kempton & Co. Ltd.

72, BENNERLEY ROAD,
S.W. 11
BATTERSEA 4991

Head Office :-

STANGATE HOUSE,
WESTMINSTER BRIDGE RD.,
S.E. 1.

ate results will be reached by the direct business methods of the salesman. The writer permits himself to dream of the time when colliery owners will embark upon an ambitious project of domestic coke manufacture in coke ovens and that they will not embark upon it alone. There will be formed a National Coke Sales Organization, in which the coke oven owners will act in collaboration with the gas companies. Such an organization will advertise and market solid smokeless fuel through district offices in every town of sufficient size in the country. Every sale of coke will be followed up by personal calls from a salesman, capable of demonstrating to the purchaser the best methods of using the fuel. As part of the advertising allocation, gas pokers will be fitted and supplied free with the first ton or possibly half ton order. Coke stoves specially adapted for coke burning will be supplied and fitted at cost price and upon hire purchase terms. If we can introduce into one hundred houses a coke stove, a gas poker, and solid smokeless fuel having first-rate combustible properties, at least ninety-eight of these houses will continue to use the solid smokeless fuel.

The whole essential of any campaign of this nature is that the fuel supplied must cost the householder no more per ton than the coal which he is at present buying. That essential factor constitutes the importance of the by-product coke oven.

Correspondence

The Editor, J.N.S.A.S.

DEAR SIR,

I was interested to note in your commentary of the Summer issue of the "Journal" the statement said to have appeared in the "Manchester Guardian," that smoke prevention could be carried out more easily and cheaply by the Police. It is, of course, quite absurd to say a smoke inspector requires no training. Having carried out smoke abatement work as a smoke inspector in three large industrial cities, I think it has become a specialists's work, especially now when the 1926 Act is in force, and a Court decision may rest on whether the best practical means have been taken to abate the nuisance. Frequently manufacturers have said to me: "Tell us where the trouble lies, and we will do our best to abate the nuisance." This is just one occasion when careful and technical investigation is necessary.

I have also been interested in the correspondence on Regional Areas, and working in Sheffield both before and after the formation of a Regional Area, I was thus in a unique position to note the changes brought about by the uniformity of administration. There is not the slightest doubt in my mind that Regional Areas are a necessity, and I fail to see why they should not work satisfactorily.

In regard to Councillor Smith's paper at Glasgow, I heartily agree that the first thing to do is to provide a substitute for raw coal, but I have had the following singular fact to contend with, namely, raw coal, in some districts, is considerably cheaper than gas house coke. The reason for this is, that the local coal is not suitable for making illuminating-gas, and the necessary coal has to be imported, causing the resultant coke to be dearer than local-mined coal. This state of affairs is a serious obstacle to a cleaner and healthier atmosphere, and will remain so until a cheap and efficient substitute for raw coal—which is adaptable for all purposes—is found and put on the market.

Yours faithfully,

E. B. HOCKEN,

Smoke Inspector to Nottingham Corporation.

Standard Bye-law for Smoke other than Black.

The Editor, J.N.S.A.S.

DEAR SIR,

Authorities have not been able to frame a bye-law definitely stating what density of smoke emitted, other than black, constitutes a nuisance. Apart from the difficulty of actually estimating the density, visually, a plant giving smoke (not black) from each of four chimneys may be making as much noxious gases as a neighbouring plant with one chimney, which is producing black, and therefore actionable, smoke.

May I suggest that a standard of density per lb. of coal burnt, taking into consideration the diameter of the chimney, might be formulated? This, while not solving the problem (at any rate until the result of optical tests at the Fuel Research Station at Greenwich are issued), would go much further forward. Thus, assume a chimney of seven feet diameter, passing gases from 4,000 lbs. of coal per hour, showing density No. 3 (Ringellman scale). The *size* of chimney is, of course, very necessary.

The Public Nuisance (shall we call it) per lb. of coal would be the sum :—

$$\frac{7 \times 3}{4{,}000} = .00522$$

or, simply,

$$\frac{7 \times 3}{4} = 5.22$$

$$\text{i.e., } \frac{\text{Diameter of chimney} \times \text{Ringellman scale of density (average over 1 hour)}}{\text{Thousands of pounds of coal per hour}}$$

The above example, itself, would be a standard beyond which smoke emission might not be allowed. There may be plants where the coal burnt per hour is not known, but it is very unlikely that there can be no means of discovering this.

From experience one has found that analysis of the flue gases does not help us here as the percentage of C.O.2 does not vary directly as smoke density, neither does the soot caught in the soot filter.

The visual method definitely associated with actual consumption of coal would appeal, I think, far more (and be, of course, much more fair to plant owners) than any optical method only, however scientific its application.

Yours faithfully,

W. LUCKHURST, A.R.SAN.I.

The Liverpool Conference

Thirty years ago, or even less, smoke abatement was considered generally as the peculiar interest of a certain type of interfering crank. At Liverpool on September 18th, 1931, a gracious civic reception was held by the Lord Mayor in the Town Hall for the purpose of welcoming to the City the delegates attending the third annual Conference of the National Smoke Abatement Society. This delightful gathering showed, more than any other event, the progress that is being made in achieving an essential step towards a truly clean atmosphere—the realization that there is a costly and highly objectionable nuisance due to coal smoke and the realization that this nuisance must be prevented.

The Conference—in spite of adverse factors—had an attendance larger than any of the previous meetings; and the programme, though perhaps suffering from some overcrowding due to limits of time, was concerned with a wide variety of important topics. Saturday morning's work in the School of Hygiene lecture theatre consisted of the Annual General Meeting, at which the usual business—the acceptance of the Annual Report and the Statement of Accounts, and the election of Officers and Committee for the year—was transacted. Then followed the first session of the conference itself, with papers by Mr. Robert Blackmore and Mr. Ralph Gibson on " The Progress of the Electrical Grid," and " Notes on the Preparation and Use of the Smokeless Fuel ' Dryco ' in Liverpool," respectively. Mr. Blackmore's paper is printed in this issue of the Journal, and Mr. Gibson's will be published in the next. Both these papers created great interest and it was regretted that shortage of time did not allow a full discussion upon them. In the afternoon, at the invitation of the Public Health Committee, three motor buses conveyed members on a tour round the city, during which the new Clarence Dock Power Station and several housing estates were visited.

The Clarence Dock Power Station.

The Station, which is not yet completed, although partially working on the day of the visit, is one of the " Selected " Stations under the Electricity (Supply) Act, 1926. It will be owned by the Corporation but operated under the control of the Central Electricity Board.

The Clarence Dock, formerly used by the Mersey Docks and Harbour Board, has been utilized for the site of the Station, which will have an ultimate capacity of 350,000 Kilowatts (approximately 460,000 H.P.). At present two turbo alternator Units, each of 50,000 KW. capacity (65,000 H.P.) are being installed; together with four boilers each capable of evaporating a maximum of 176,000 lbs. of water per hour to steam at 450 lbs. per square inch pressure and a total temperature of 825°F. One of these boilers was working at the time of the visit, when a complete absence of smoke was a notable feature. The water for circulating purposes will be drawn from, and returned to, the River Mersey by means of duplicate ducts which pass under the Clarence Half Tide Dock. Each duct is capable of dealing with a maximum water quantity of 16,800,000 gallons per hour. The ducts for the complete Station have been installed at the outset.

Coal will be stored in the part of the Dock not occupied by the Power Station, and can be flooded. The total capacity of coal storage in the Dock and in the Bunkers is approximately 95,000 tons. The site was taken over from the Dock Board early in 1929 and the first turbo alternator was in commercial operation at the end of July, 1931.

The Station is using a new type of washing plant for the removal of sulphurus fumes and grit from the flue gases. This is expected to remove a very high proportion of these deleterious products, and was designed by Mr. P. J. Robinson, the City Electrical Engineer. The excellent arrangements for examining the station had been made by Mr. Robinson himself, who conducted one section of the party; and our thanks are due to him for the attention we received.

The visits finished at Calderstones Park, where tea again at the invitation of Alderman Muirhead and the Public Health Committee, was served.

Saturday evening was spent in informally discussing various problems with much benefit to those who were present. The subject of the broadcast talk of the evening on " The Event of the Week in the North " was the Conference itself; but unfortunately the radio set which had been obtained to permit the talk being heard, refused to work owing to electrical interference from the Hotel plant and mains.

The last session of the Conference, on Sunday morning, consisted of a most valuable series of papers on the work of each of the Regional committees. Thanks to the co-operation of each body a statement from each of the five was heard, and together they gave a new and useful summary of this comparatively new, and potentially powerful, type of activity. These papers will not be printed in the JOURNAL, but are being published separately in booklet form with the general title of " Smoke Abatement on a Regional Basis."

The Conference concluded with a demonstration very different in character, but of great interest, of the apparatus used for soot measurement and similiar atmospheric observations. For this we are indebted to the Department of Scientific and Industrial Research fo the loan of the apparatus and to Professor Roberts, th Liverpool City Analyst, for the very considerable trouble he took in fitting up the instruments and for the clear way in which he explained their intricate workings to an audience that was obviously fascinated by it all.

In spite of the fact that the country went off the gold standard the same day, Monday's newspapers contained full reports of the Conference. In all, over 160 cuttings dealing with the Conference have been received, showing that the good results of such a meeting are not confined to the four walls of the lecture room, but are disseminated throughout the country in a way that helps the movement very considerably.

W-D

Our Ideal
"A Smokeless City"

The
WOODALL-DUCKHAM COMPANY
are
manufacturers of
Continuous Vertical Retorts
Intermittent Vertical Chambers
and
Other Plants
for
Conserving Coal
and
Providing Smokeless Fuels

Head Office:-
ALLINGTON HOUSE 136-150 Victoria St., LONDON. S.W.1

District Offices:-
MANCHESTER 78 King St..
GLASGOW 82 Gordon St..
SHEFFIELD 22 High St..

THE WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO.. (1920) LTD..

HOUSEWIVES recommend the "Metro" open smokeless coke fire because it saves the work of fire making and hearth cleaning, burns brightly without attention for three to four hours, and is cheaper in use than a coal fire.

A "Metro" coke fire is practically dustless, and so room cleaning is reduced and curtains and hangings keep clean for a longer period.

Follow the lead of numerous doctors and hospitals by installing a "Metro" coke fire in *your* home. Every "Metro" coke fire in use helps to reduce the smoke pall which brings destruction and disease in its train.

An illustrated list of all types of "Metro" coke fires will be forwarded on request.

SIDNEY FLAVEL & CO. LTD.

Stove Makers since the reign of King George III

LEAMINGTON

The Progress of the Electrical Grid

A PAPER BY R. BLACKMORE, M.I.E.E.

The term "Grid" which was originally coined by Lord Weir in the report prepared by the Committee over which he presided in 1925, has now become an accepted everyday term, used not only by Engineers but by the general public in referring to the Scheme of high pressure transmission lines now being erected by the Central Electricity Board in this Country. The Grid is the latest stage in the 50 years development of the Electricity Supply Industry.

The foundation of the regular development of Electricity Supply was the passing of the 1882 Electric Lighting Act, but Parliament did not foresee the great possibilities of the new system of power for which they were legislating and so the 1882 Act became only the first of a long series of statutes. From 1882 to 1900 the business of Electricity Supply was entrusted to purely local undertakings, as in those days electricity was chiefly used for lighting purposes.

The period from 1900 to 1909 witnessed the rise of larger Undertakings including the Power Companies, whose function is to give supplies over much wider areas for power purposes generally, in addition to supplies in bulk to smaller Undertakings.

The war period brought to light more quickly than would otherwise have been the case, not only the great advantages of electric driving but also the wastefulness of the existing organization in regard to generation.

In 1917 Parliament set up the Williamson Committee, which recommended the replacement of the parochial system of generation and distribution by more economical methods on broader lines, and this led up to the Electricity (Supply) Act of 1919. Under this Act, a Body known as the Electricity Commission was set up. The Commission have been able to carry out a great amount of valuable pioneer work, but progress in regard to co-ordination was extremely slow owing to the many conflicting interests concerned, and to the limited powers given to the Commissioners.

In 1925 the Weir Committee was appointed to investigate the position of the industry and their recommendations were embodied in the Electricity (Supply) Act of 1926. This Act, in the main, provided for the creation of the Central Electricity Board charged with the duty of co-ordinating the generation of electricity for public supply in Great Britain. The Act empowers the Central Electricity Board to *select* a certain number of the generating stations which will still be operated by their present owners, but operated under the direction of the Board. The Board does not deal with the distribution of the energy or its supply to the ultimate consumers. This duty still remains in the hands of the distributing authorized Undertakers, municipal or company as the case may be.

The Board has selected the most economical stations in the various districts, and the non-selected or less economical stations will gradually be closed down.

In order to make the best use of the plant in the selected stations, and also to give supplies to Undertakings which do not own selected stations, the high tension transmission lines of the Grid are now being erected throughout the country to inter-connect the stations. In this respect the British Grid System differs fundamentally from many high tension systems in other countries. It is primarily a system of inter-connectors between generating stations situated for the most part near the load centres, whereas systems abroad generally serve to transmit large blocks of energy over considerable distances, from generating stations to load centres.

For the purpose of construction and operation, the Board has divided Great Britain into ten Districts. Work has been commenced in nine of these Districts as follows :—

Central Scotland.
South East England.
Central England.
North West England.
Mid-East England.
North East England.
South West England.
East England.
South Scotland.

A pressure of 132,000 volts has been adopted for the Main Grid and 66,000, 33,000, and 11,000 volts for the secondary transmission lines.

Approximately 3,000 miles of Main Grid lines are to be erected and 1,100 miles of Secondary lines, making a total of 4,100 miles in the nine schemes adopted by the Board up to the present.

Wayleaves.

The first step in the construction of the system is the obtaining of wayleaves for lines and substation sites. The majority of landowners have shown a helpful and public spirit in their recognition of the need for facilitating the Board's work, and the same is true of the National Trust, the Ancient Monuments Board and other Associations. The policy of the Board has been to use all reasonable endeavours to secure co-operation and not to use their compulsory powers in regard to obtaining wayleaves unless absolutely necessary. It is a matter of satisfaction that the number of cases in which it has been necessary to apply to the Minister of Transport for compulsory wayleaves forms a very small percentage of the total obtained.

Acquisition of sites for the erection of transforming stations has presented some little difficulty, particularly in the dense inner London area where it is not easy to obtain suitable accommodation near the generating stations.

Before the route of a line is finally decided, the Board must consult with the Post Office regarding the effects of the lines on communication circuits, with the Air Ministry so far as interference with aerodromes and air routes is concerned in addition to many other interests affected. In the matter of amenities, the Board have retained the service of Sir Reginald Blomfield, R.A., as Consulting Landscape Architect.

Up to the present time wayleaves have been obtained for nearly 3,000 miles, and towers have already been erected to the extent of about 1,500 miles. Upwards of 500 miles of lines are now in operation, and giving supplies to various Undertakings. The Grid lines are arranged partly as a system of rings and partly as duplicate lines, so that each Undertaking will have a duplicate supply and continuity will be maintained in the event of a breakdown on any particular line. The nominal carrying capacity of each main Grid line is 50,000 K.V.A.

After careful investigation into the many types of towers used in other countries, the Board decided to adopt a lattice steel construction. In most districts the towers are built of galvanized steel sections and experience has proved that not only is this economical so far as maintenance is concerned but a weathered galvanized tower is much less conspicuous than a similar painted structure.

The standard straight line tower for the main grid has a base of 15 feet square and a height of 77 feet to the apex. This allows for a minimum clearance of 22 feet from the lowest conductor to the ground. Special towers are necessary at angles in the line as well as in places where additional clearance is required as for instance over buildings, rivers and railways.

The standard line conductor consists of a central core of seven steel strands surrounded by 30 strands of aluminium. The diameter of the whole conductor is slightly more than three quarters of an inch, and is equivalent in conductivity to a pure copper wire with a diameter of about a quarter of an inch. For long crossings a stronger conductor of 19 steel and 18 aluminium strands is used.

The normal span for primary lines is 900 feet so that there are about six towers to the mile. On the other hand natural features sometimes permit or demand longer spans, such for example as the River Forth crossing which has a span of over 3,000 feet. The River Cart in Central Scotland is crossed by a primary line with a span of 650 feet at a minimum height of 188 feet above high water. In this case the towers are 218 feet high. The River Clyde at Yoker requires a clearance of 228 feet at high water, the towers being 275 feet high with a span of 980 feet. The River Forth crossing requires a clearance of 158 feet at high water and the towers are 340 feet high.

The work of the Board also includes the provision of a large number of Sub-stations for transforming the Extra High pressure of the Grid to the working pressure of the local Undertakings.

It is estimated that the final cost of the Grid including Sub-stations will approximate £30,000,000 According to the calculations of the Electricity Commissioners, the estimated gross savings to the Undertakings during the first five or six years will approximate £13,000,000. This saving will be brought about by (1) the reduction in the capital expenditure on new plant installed, (2) by the concentration of generation in the most efficient stations and (3) by the distribution of the loads to the best advantage.

At the present time electrical energy is being supplied by approximately 500 stations ranging in size from 18 kw. to 160,000 kw. At one end of the scale 76 of these stations, each having an installed capacity of 25,000 kw's or over, contain over 69% of the generating plant, while, at the other end of the scale, 200 of the stations have less than 2,000 kw's each. The Clarence Dock Station of the Liverpool Corporation is designed for an ultimate capacity of 400,000 kw. The total capacity installed in Great Britain is 6,600,000 kw's, but the maximum aggregate load recorded is only 3,600,000 kw's. The plant capacity at present is therefore 83% in excess of the aggregate demand.

The Grouping of Stations.

It is obvious from these figures that by interconnecting the generating stations by means of the Grid a large proportion of existing plant at present standing idle can be utilized to meet increasing demands, and the proportion of spare plant be reduced to a more reasonable figure of say 30%.

In order to obtain the most economical generation over a district or the country as a whole the various generating stations will be divided into three groups, i.e.,

(1) Base Load Stations.
(2) Two Shift Stations.
(3) One Shift or Seasonal Stations.

The base load stations will be those where large and most economical plant is installed and as far as practicable will be operated at their most economical load during the whole of the 24 hours. The coal consumption per unit generated at this class of station will be of the order of 1.1 lbs. corresponding to a thermal efficiency of about 25%. The latest returns of the Electricity Commissioners show that thermal efficiencies at various stations throughout the country vary from 23.8% down to 4% with coal consumptions varying from 1.17 lbs. to 8.0 lbs. per unit generated.

Doubts have sometimes been expressed as to whether the Scheme of the Board will result in a cheaper supply to the Undertakings or whether the result will be the reverse. Owners of Selected Stations are fully protected by Section 13 of the Act which provides that where the owners of a selected station who take a supply of electricity from the Board prove to the satisfaction of the Electricity Commissioners that the cost of taking that supply from the Board exceeds the cost which they would have incurred had the Act not been passed, then the charges by the Board shall be so adjusted that the amount charged to them does not exceed the cost which, in the opinion of the Electricity Commissioners, the Undertakers would have incurred in themselves generating the electricity.

There is no doubt whatever that the Grid Tariff will be greatly to the advantage of the owners of non-selected stations and to purely distributing Undertakings.

The Growth of Electricity.

At this point it may be of interest to review the growth of the existing undertakings up to the present time. During the last few years for which statistics are available the units sold in Great Britain were as follows :—

1926	5,723,653,523.
1927	6,850,162,808.
1928	7,603,240,446.
1929	8,596,553,054.

Wipe out that smoke!

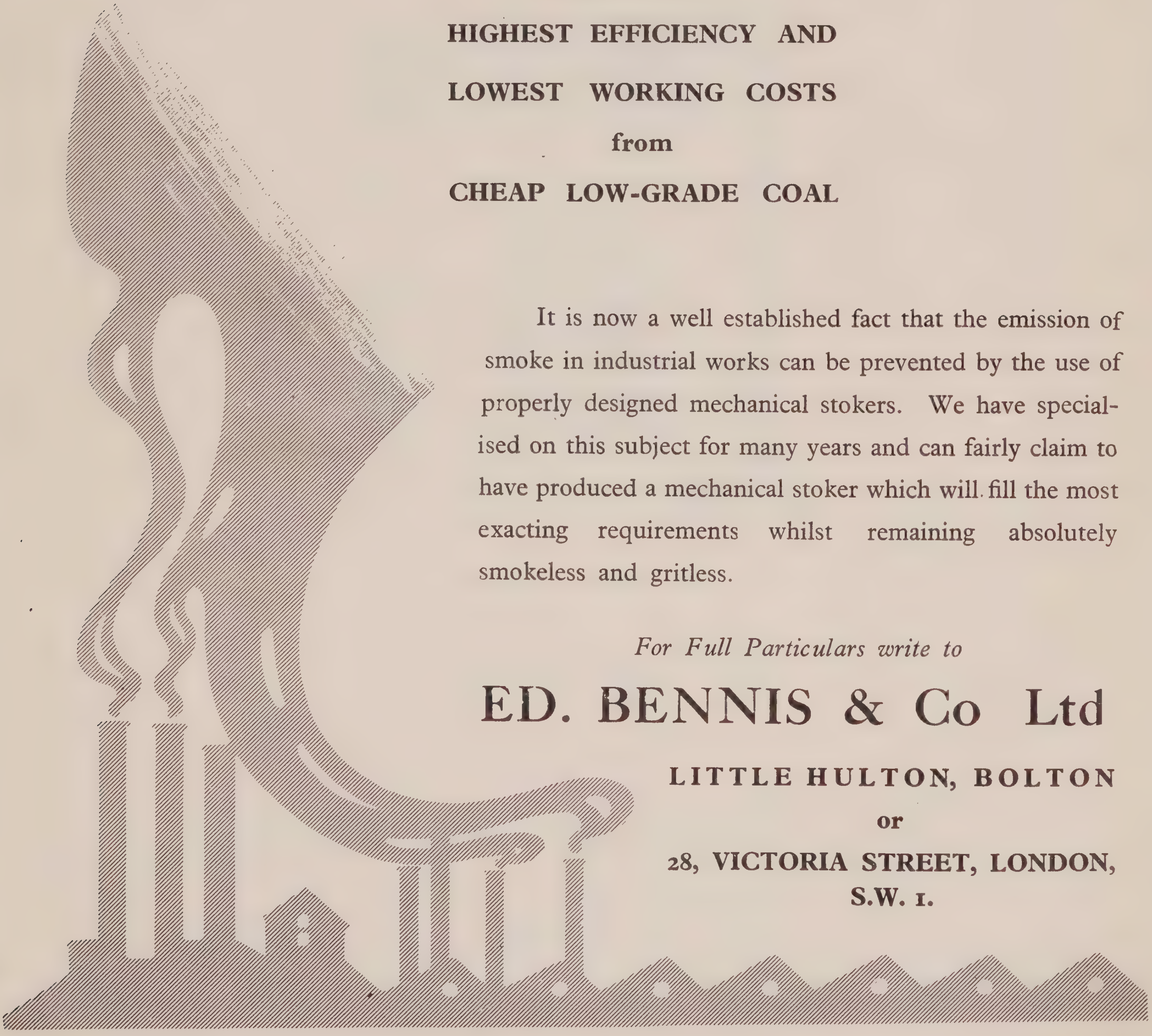
"BENNIS" STOKERS

ensure

ABSOLUTELY SMOKELESS COMBUSTION

combined with

HIGHEST EFFICIENCY AND
LOWEST WORKING COSTS
from
CHEAP LOW-GRADE COAL



It is now a well established fact that the emission of smoke in industrial works can be prevented by the use of properly designed mechanical stokers. We have specialised on this subject for many years and can fairly claim to have produced a mechanical stoker which will fill the most exacting requirements whilst remaining absolutely smokeless and gritless.

For Full Particulars write to

ED. BENNIS & Co Ltd

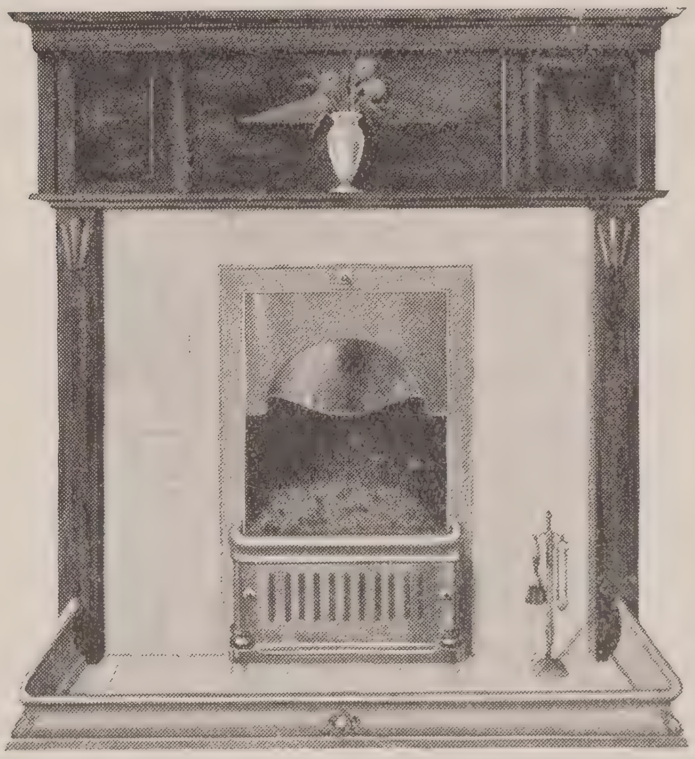
LITTLE HULTON, BOLTON
or
28, VICTORIA STREET, LONDON,
S.W. 1.

'SANTORE'

the new Coke Fire

Economy of Fuel
Bright open fire
Smokeless
Sliding Canopy
Ventilating Front

Perfect Control of Fire from dull red to bright white
Adapted for Hot Water Supply if required.



Stout Cast Iron Interior, Cast Iron Fire Bars, Damper and frame fitted Wrot Iron Rod and Knob. Refractory Fire brick back and bottom.

Write for details and modes of Fittings to the makers ....

NEWTON CHAMBERS & Co., LTD.

MOORHEAD,
SHEFFIELD, Eng.

Tel. Add.: "ENSEE." SHEFFIELD.
Tel. No. 20351 (2 Lines).

M
B

In spite of the industrial depression the average annual increase in consumption has been approximately 12%, and the units consumed during the above period have therefore increased from 133 to 193 per head of the population. It is estimated that within ten years the annual consumption will have risen to between 400 and 500 units per head of the population.

As all the selected stations will be operated by their owners to the directions of the Board, it will be interesting to consider how the control will be effected. In each area there will be a control room where the operating staff will be at work during the whole of the 24 hours. This control room will act as a nerve centre for the whole district, and control circuits will radiate therefrom to all selected stations and to the substations of the Board. In each control room a switchboard and a system diagram will be erected, fitted with instruments and indicators. The Control Engineer on duty will not only be able to telephone his instructions to the various points of supply, but will actually see whether his instructions have been carried out. Instruments will show him the actual operation of the Grid switches, the voltage of the Main Grid, the amount of load being generated at each station, and the flow of power into and out of the Grid. One of the most important duties of the control staff will be the strict adherance to the standard frequency of 50 cycles per second, and one station in each area will be delegated to act as frequency controlling station.

It is estimated that at least 8,000 route miles of control circuits will be used throughout the country, and it is probable that post office circuits will be used for this purpose.

Careful compilation and comparison of the load at all points in previous days and years will enable the control staff to forecast very closely the requirements of each part of the area, and a comprehensive programme will be drawn up showing just when each station should start up its generators, when they shall be coupled to the system and what load they are to carry. As the load grows each day the Control Engineer will be able to compare the actual loads at all points with his programme modifying it when necessary, so as always to have sufficient spare plant available to meet emergencies, should they arise. The Control room for the North Western Area will be in Manchester and from here will be controlled all the generating stations from Carlisle to North Wales.

Change of Frequency.

As the Electricity Commissioners have adopted a standard frequency for the country of 50 cycles per second it has been necessary to change the frequency of certain Undertakings in order to obtain the full advantage of interconnecting the whole country. At the present time the frequency at a number of Undertakings in Scotland, Central England and South West England is 25 cycles per second, whilst in North East and North West England certain Undertakings employ a frequency of 40 cycles.

The gross cost of the Frequency Change is estimated at approximately £19,000,000, but about £4,000,000 will be recoverable from the Undertakings as antedated expenditure. It will be appreciated that this change of Frequency entails a large amount of co-ordination and organization by the Board and the Undertakings concerned, as not only has the existing generating plant at the various stations to be replaced, but the whole of the motors on consumers premises have to be changed without unduly interfering with productive industry. The Central Scotland Scheme is now practically complete and has been operating for some little time. The actual experience already gained confirms that the results which are anticipated will be obtained when the whole " Grid " is completed and in operation. At the present time eleven selected stations with an installed capacity of half a million kilowatts are running in parallel on the Grid including the new water power station of the Grampian Power Company. Generating Stations at Dunfermline, Greenock, Kilmarnock and Paisley, where uneconomical plant is installed have been shut down and these undertakings now rely on the Grid for their supplies, and in addition the Dundee Station is being operated as a two shift station only.

At certain power stations connected to the system failures of plant have occurred which, under individual operation would have curtailed the local supply, but the Grid has automatically taken over the load and supplies to consumers have not been affected.

As regards the question in which your Society is particularly interested, it is suggested that the Grid will be of some assistance in the abatement of smoke. Hitherto industry has always been crowded together, firstly along river courses for power purposes and later, adjacent to the coal fields, but now the trend is in many cases towards garden cities, and soon we may hope to see garden industrial cities without a single domestic or factory chimney. The domestic open fire is one of the worst offenders in polluting the atmosphere and the great increase in recent years in the use of electricity for domestic purposes is already having a marked effect in certain areas on the cleanliness of the air.

Steam railways have long made a substantial contribution to the amount of impurities in the air of our great cities and the gradual electrification of the railways will appreciably reduce the grit and smoke nuisance.

You are, of course, aware that the Electricity Commissioners are investigating means for preventing the emission of oxides of sulphur and grit from the chimneys of large power stations, and various installations are being erected throughout the country to overcome any cause for complaint in this direction.

You will have an opportunity of inspecting the new system designed by Mr. Robinson, the City Electrical Engineer of Liverpool, which has been installed at the Clarence Dock Generating Station to eliminate any damage from the products of combustion at that Station

Every new application of electricity to any purpose where an open flame is at present used represents a transfer of combustion to a scientifically operated power station where the fuel is burnt under carefully regulated conditions and the products of combustion are disposed of so as to produce the very minimum of pollution.

As the policy of the Board is to make electrical energy available throughout the country, at an attractive tariff, it is certain that the Grid will make an appreciable contribution towards the realization of your ideals.

Public Health and Smoke Abatement

A course of lectures on Smoke Abatement, arranged by the Royal Sanitary Institute for sanitary and smoke inspectors in view of the increasing interest taken in the subject by local authorities, was opened by Sir Lawrence Chubb, the Honorary Advisory Secretary of the National Smoke Abatement Society, who described the extended powers now available for dealing with smoke nuisances by the operation of the Public Health (Smoke Abatement) Act, 1926. The Regional Committees set up under that Act had done much good work and signs were not wanting of the growth of a desire on the part of manufacturers to co-operate with local authorities in the cause of Smoke Abatement.

It was too soon yet to form an opinion as to the probable effect of the bye-laws recently made by the London County Council. All other Councils around London would, it was hoped, adopt similar bye-laws, so that the whole of the Greater Metropolitan Area would be dealt with on a uniform basis when the present system which led to undue stringency in one neighbourhood and laxity in the next would disappear.

Meanwhile no further distinct progress would be gained against avoidable atmospheric pollution until the Ministry of Health permitted local authorities to make bye-laws with regard to factory smoke that was not actually black in colour.

Sir Lawrence further observed that next year the question would arise whether the special concessions granted to the iron and steel industry by the Smoke Abatement Act should be terminated, as the five years of grace would then expire. It was in his view doubtful if anything should or could be done to terminate the concessions during the present economic crisis.

In regard to smoke and fume nuisances from vehicles, which the lecturer said had increased owing to the great expansion of mechanical transport and motor traffic: it was satisfactory to observe that the regulations recently issued by the Ministry of Transport under the Road Traffic Act provided a swift and summary remedy against avoidable smoke or visible vapour. The regulations were simple and effective and a great improvement upon the remedies hitherto available: if enforced they would undoubtedly bring to an end a cause of much complaint.

The Smoke Abatement Handbook

The Society has just published the first edition of its "Smoke Abatement Handbook" which, in the Foreword, is described as "a modest attempt to set down, concisely and yet as comprehensively as possible, the numerous facts and figures with which the smoke abatement movement and its workers are concerned. It is hoped that it will be useful to all who may have occasion to speak or write upon this subject, and that it may even induce others to commence to speak or write." Every aspect of the subject is touched upon, and there are several authoritative articles by well-known experts. The Handbook has been well reviewed in the Press, and the following is quoted from "Municipal Engineering and Sanitary Record":—

"A very useful little booklet entitled 'The Smoke Abatement Handbook,' published for the National Smoke Abatement Society by The Service Guild, 45, Deansgate Arcade, Manchester, has just come to my notice. Although it contains only some fifty pages, it contains quite a mass of information, much of which will be new to Inspectors. The matter, which is of quite a copious character, is exceedingly well arranged, and brevity—so much to be desired in these days—is a pleasing feature. Dr. J. R. Ashworth contributes an article on 'The Measurement of Atmospheric Pollution,' and there is an interesting article on 'Smoke and Health,' by Dr. J. S. Taylor, M.D., D.P.H., Assistant Medical Officer of Health, Manchester. A careful compendium on 'The English Law Relating to the Emission of Smoke,' is exceedingly useful, and Mr. Sidney N. Duguid, B.Sc., writes clearly and concisely on the important subject of 'Industrial Smoke Abatement,' while Miss Marion Fitzgerald, A.R.San.I., deals with 'The Domestic Smoke Nuisance.' On the subject of 'Low Temperature Carbonization,' Dr. Margaret Fishenden, of the Department of Scientific and Industrial Research, gives useful information in tabloid form, and 'Electricity and Smoke Abatement' is contributed by the British Electrical Development Association. It will be gathered from this brief and cursory synopsis that the booklet, which costs sixpence only, is full of 'meat.' A touch of humour is imparted by an item in a chronological table which reads:—'1257 A.D., Eleanor, Queen of Henry III., left Nottingham on account of the smoke nuisance.'"

We ask our readers to assist us in distributing the Handbook as widely as possible. It is priced 6d., post free, or 5/- a dozen copies. Local authorities, firms, and associations wishing to distribute copies on a larger scale may obtain them for 30/- per hundred.

News and Notes

The Huddersfield Smoke Abatement Council.

A full winter's session has been arranged by this very active body, which is proof that the previous work has been both successful and appreciated. There are two distinct courses of fortnightly lectures at the Huddersfield Technical College; the first, given by Mr. Edgar Lunn, is a series of ten lectures on Boiler House Practice; and the second is a series of ten on Engine and Boiler House Practice, a more advanced course, by Mr. J. H. Bottomley. In addition to this Mr. Lunn is conducting a Discussion Circle which is primarily intended for men who have obtained a Certificate in the Engine and Boiler House Practice course.

During the summer several visits were made by the Council to works and pits, and a still wider view of the subject will have been thus obtained by the members. The work that is being done in Huddersfield is an example to every other town, and we extend to those who are organizing it so well our good wishes for continued success.

FOR CLEAN AIR AND
MAXIMUM SUNLIGHT

USE THE SMOKELESS COAL
NATURE HAS HERSELF PROVIDED

ANTHRACITE

ABSOLUTELY SMOKELESS
HIGHEST IN CARBON, LOWEST IN ASH
VERY SLOW BURNING
SAFE, CLEAN AND ECONOMICAL IN USE
MINIMUM ATTENTION—IT NEVER GOES OUT

THE BEST FUEL FOR—
DOMESTIC HOT WATER BOILERS
CENTRAL HEATING
OFFICE, WAREHOUSE, GREENHOUSE AND GARAGE HEATING

ENQUIRIES AND DESCRIPTIVE LEAFLETS :—

AMALGAMATED ANTHRACITE COLLIERIES LTD.

120, FENCHURCH STREET,
LONDON, E.C. 3.

Spring Cleanliness Every Day

Electricity Ensures Clean Air Everywhere

In your attack on dust and dirt every day your best aid is an Electric Suction Cleaner.

The Electric way of cleaning, collects dirt and allows it to be destroyed without danger to health or scattering the dust everywhere.

It is important in a house where there are children that the floor should be free from germ-carrying dust.

Use Electricity for Lighting, Heating, Cooking and Domestic Help

Send for a free copy of "The House you Want"

issued by

THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.
15, Savoy Street, London, W.C.2.

Smoke Abatement in Salford.

The Annual Report of Dr. H. Osborne, the Medical Officer of Health for Salford, contains, as usual, some interesting observations on smoke abatement problems. Further experiments with vertical retort coke, which is used in open fires throughout the Health Department, are reported. Twenty-eight comparable observations carried out during the winter show that to keep the average temperature of a room at 63.6°F., 14.2 lbs. of coke were consumed daily. With best house coal, keeping the room at an average temperature of 63.7°F., 19.6 lbs. of fuel were required daily. This shows that the efficiency ratio is 1.35 in favour of the vertical retort coke. In addition, of course, the price of the coke is much lower than that of the coal.

Observations of the strength of sunlight by means of Potassium Iodide Test are carried on at four stations within and outside the City. An analysis of the figures for each day of the week is given, but the results do not lend much support to the supposition of clearer week-end skies with a corresponding increase in week-end daylight. There is comparatively little difference in the average figure for the best day and the worst day. A further very interesting analysis shows the relation of wind direction and the amount of daylight at two stations on opposite sides of Manchester and Salford. One station is Drinkwater Park, which is three and a half miles *north-west* of Manchester Town Hall ; the other Nab Top, is nearly nine miles *south-east* of Manchester Town Hall. When the wind is north to west (208 days in 1926 and 1927) daylight is 21% better at Drinkwater than at Nab Top ; but when the wind is east to south (274 days in 1926 and 1927), daylight is 7% better at Nab Top than Drinkwater Park.

Kindling Fires Without Smoke.

Observation in the early morning, when the atmosphere for a brief period is clear and wholesome tends to prove that the first, and probably the worst cloud of coal smoke arises from domestic fires in the process of being kindled. Distilled from fresh coal, at a comparatively low temperature, the smoke is heavy and persistent forming a nucleus for the accumulation later of emissions during the day.

If, instead of using paper and firewood, the kindling of a coal fire—in cases where coal is still used—could be accomplished quickly, and at a high temperature, it is obvious that the particularly objectionable smoke arising from this process would be largely, if not entirely, eliminated, and, at the same time, money, fuel and labour should be saved. Householders and members of the N.S.A.S. will be interested to know that both objects have been achieved by the introduction of a new portable gas fire-lighter, now obtainable through any gas office.

The new appliance is not to be confused with the "Gas Poker." It gives positive ignition in a few minutes. If the fire-lighter is allowed to burn under the fire for ten minutes it consumes all the smoke formed in the process of kindling a coal fire at a cost for gas considerably less than that of a bundle of firewood.

This firelighter greatly facilitates the use of smokeless gas coke as fuel. Hitherto the difficulty of ignition has rendered coke less popular for use in open fires than it should be. In a 16in. coke fire, positive ignition is obtained in 15 minutes ; in a domestic coke boiler, less then ten minutes are required, usually only six minutes, with coke nuts as fuel.

Huddersfield's Loss in Wasted Coal.

In the first of the winter series of lectures on Boiler-house Practice (mentioned elsewhere in this issue) Mr. Edgar Lunn said that he estimated the number of boiler plants in the Huddersfield district at 250, and the average avoidable loss at approximately 1 cwt. of coal per working hour at each factory. If this was the case the total annual loss in the district due to wastage of coal alone, amounted to about £25,000.

Dover Tackles the Smoke Problem.

Owing to complaints, the chimney of a Paper Mill in Dover was kept under observation, and as a result it was considered that smoke was emitted in such quantity as to be a nuisance.

During a discussion of this in the Public Health Committee, Councillor Dawes said he did not think that they should make so many complaints about the Paper Mills and the smoke. It was a pity that they could not see a little more smoke coming from others. They were only working two-thirds of the week. He would not complain if the wind drove a little smoke down on him.

Councillor Morecroft : "We should ask other firms to make a little more smoke."

Councillor Dawes : "Tell them to whitewash their coal."

The Firing of Chimneys.

From observation at Liverpool it has been found that the wilful or inadvertent firing of chimney flues tends considerably toward the pollution of the atmosphere. Last year the number of convictions for this form of offence was 2,520 as against 2,320 the previous year, which shows an increase of 200 convictions. In this connection Dr. A. A. Mussen issued an appeal, as follows :—"It is deplorable to think that certain of our population wilfully fire their chimney flues or allow them to become so dirty that they inadvertently fire and clear themselves, to the detriment of the whole surrounding neighbourhood. The medical officer of health wishes to make a special appeal to all householders to assist him in the general cleanliness of the city and purity of the atmosphere, by having their house flues swept and cleaned at least twice a year, where coal is used as fuel in the fireplaces." Prosecutions for this kind of offence are carried out by the police, who are doing very estimable work in assisting in the prevention of atmospheric pollution.—*Medical Officer*.

"Smokeless Coal."

Although all grades of coal do emit smoke when burning, certain types may be termed "smokeless" when the volume thrown off is comparatively small, according to a decision of the Circuit Court of Appeals for the Southern District of Indiana, U.S.A. Judge Alschuler, expressing the opinion of the court, declared it to be well known that all coal emits smoke, that some grades give off great quantities while in combustion ; that when a grade of coal giving off but a minimum amount of smoke is offered for sale it is not deceptive to call it "smokeless," because all coal users accept the term as comparative. The decision was rendered in the suit of Harvey v. American Coal Company and others.—"Bradstreets."

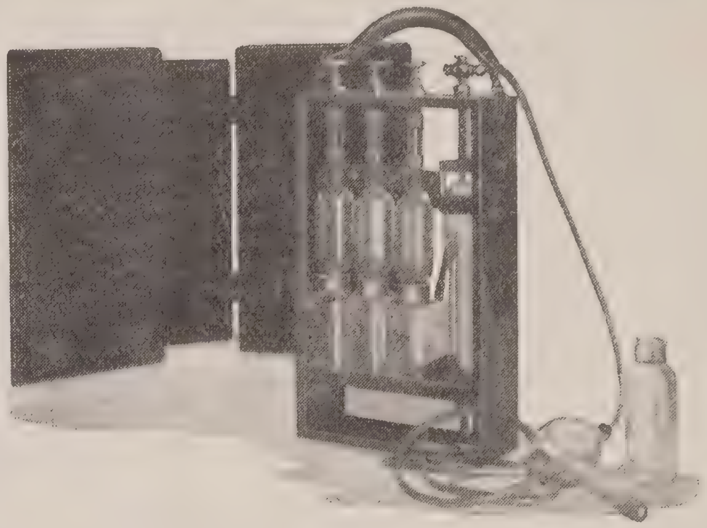
Coke Sales in Halifax.

During the last financial year the sale of the new domestic coke sold by the Halifax Corporation Gas Department has increased from 86,712 bags to 107,861 bags, delivered, at 1/3 each. During the same period 226,483 threepenny bags, compared with 141,341 in the previous year, were sold over the counters of 120 retail shops. This smokeless tuel has been tested by the National Smoke Abatement Society, and it can be recommended as a high-grade coke, being clean, dry, and easy to ignite, as well as possessing a high calorific value.

Historical Note from Greenock.

"A number of years ago an Act of Parliament had to be passed to curtail the black smoke nuisance, and in Greenock several prosecutions took place. To-day the Order is somewhat of a back number because, unfortunately, there are not many works' chimneys in operation, but in certain localities the public have to contend with grit flying around, which is both a nuisance and a danger, especially when it gets into people's eyes. Science has overcome many things, and perhaps some day the matter complained of will be rectified."—
Greenock Telegraph.

CO2 TESTS AT THE RATE OF ONE PER MINUTE ! !



HAYS PORTABLE GAS ANALYSER.

The above analyser is still the most suitable instrument for making rapid, accurate, tests of the CO2 percentage in flue gases. Also deals with Oxygen and Carbon Monoxide.

Full particulars from the makers

DUGUIDS LTD., LYMM, Cheshire

THE JOURNAL OF THE NATIONAL SMOKE ABATEMENT SOCIETY

is undoubtedly the ideal medium in which to advertise Smokeless Fuels and every appliance or device for minimising or abolishing the smoke nuisance. The advertisement rate is very moderate, while advertisers are assured of **every copy** of the Journal reaching the people who are working for this great modern reform. Smoke Abatement is not a theory ; it is not merely hygienic propaganda. **It is a step forward in the life of the nation.** The movement is making wonderful progress ; it is overcoming all old-fashioned prejudices. Its advance is irresistible. Every engineering firm which produces smoke-abating appliances, and every maker of smokeless fuels, should openly associate themselves with this great national reform, by advertising their products in the **only** National Journal devoted to Smoke Abatement.

Enquiries as to advertisement space should be addressed to the publishers :

THE SERVICE GUILD
54, Deansgate Arcade, MANCHESTER.

NO

SMOKE SOOT
DUST or ASHES

if you let HADENS instal MODERN SYSTEMS for

STEAM RAISING, CENTRAL HEATING,
HOT WATER SUPPLY, VENTILATION,
by
OIL-FIRED BOILERS
ELECTRIC THERMAL STORAGE

Extensive Experience. Many Installations.

G. N. HADEN & SONS
Estab. 1816 LIMITED

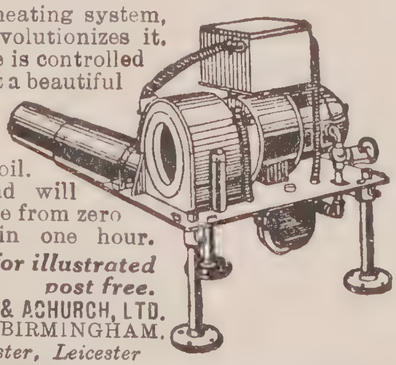
Heating, Ventilating and Electrical Engineers

Works and Head Office
TROWBRIDGE

Also at LONDON, MANCHESTER, BIRMINGHAM, GLASGOW, DUBLIN, LINCOLN, BRISTOL, BOURNEMOUTH, NEWCASTLE, TORQUAY, LIVERPOOL, EASTBOURNE

WHY NOT HEAT WITH OIL FUEL THIS WINTER?

IF you are considering installing central heating or are dissatisfied with your present system you certainly must investigate the Parwinac Automatic Oil Burner Heater.



Coupled to any heating system, it absolutely revolutionizes it. The temperature is controlled **automatically** at a beautiful "evenness." No stoking, no odours, no dirt, burns cheapest oil. Switches on and will raise temperature from zero to 55 degrees in one hour.

Write to-day for illustrated Brochure OB post free.

PARKER, WINDER & ACHURCH, LTD.
Heating Engineers, BIRMINGHAM.
London, Manchester, Leicester

O.B.X.

Parwinac AUTOMATIC
OIL BURNING HEATER

TELEGRAMS: "WALSH'S, 430 BOLTON"
TELEPHONE: 430

ROBERT WALSH

(ROBERT WALSH)

M.I.H. & V.E. M.I.P.

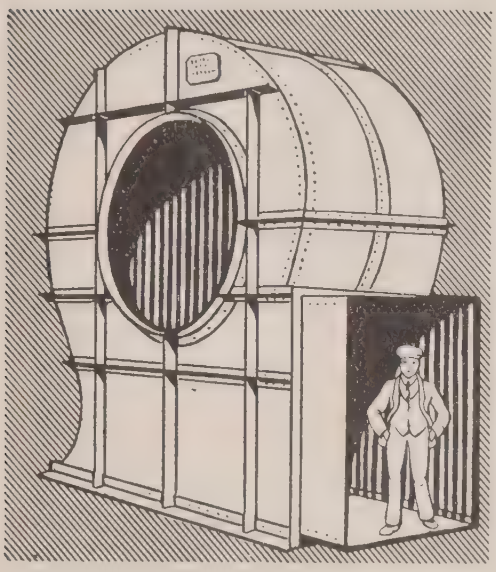
PLUMBERS, HEATING,
LIGHTING AND
VENTILATING ENGINEERS

FIRE ESCAPES, APPLIANCES,
HOSE REELS, &C., &C.

DAUBHILL, BOLTON

‘CYCLONE’ FANS

for induced draught



Write for explanatory Booklet 66 F

INDUCED draught for Steam Boilers offers innumerable economies, and to prefer the “Cyclone” system of Induced Draught is the initial economy. Its scientific application of the principles involved and its reasonable cost to instal make it of first consideration.

MORE STEAM—LESS COAL—ELIMINATES BLACK SMOKE

These are the primary advantages the “Cyclone” System ensures. Saves you as much as 25% of fuel, and definitely increases boiler efficiency. New boiler houses fitted with “Cyclone” do not need tall chimneys.

MATTHEWS
& YATES LTD
SWINTON MANCHESTER

©

JOHN TURTON & SONS

M. I. P.

PLUMBERS

Domestic Hot and Cold Water
Fitters in all Metals by
Smokeless Fuel, Gas or Electricity
Sanitary and Heating Engineers.

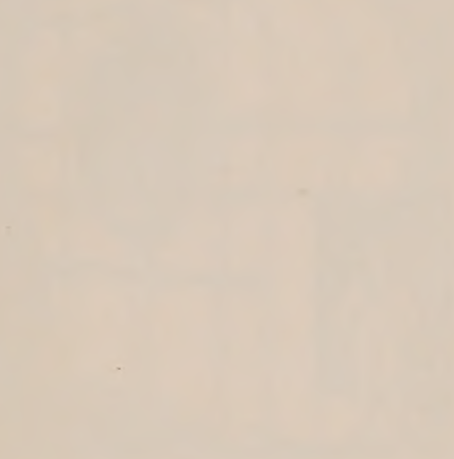
Estimates Given.

43/45, Higher Cambridge Street,
Chorlton-on-Medlock, Manchester

£100 The Subscribers hereby bind themselves to pay the above sum to the Proprietors of any steam boiler or boilers in which the Seotoo Complete Combustion Furnace fails to bring about a saving of from 5% to 25% in fuel costs, and in addition prevents the formation of smoke to the satisfaction of any Municipal or Local Regulations. Only one condition is imposed. The fuel used in the test must be about the lowest grade obtainable. For and on behalf of SMOKE PREVENTION LTD.
H. J. BULLEN, Director and Secretary,
1, Victoria Street, London, S.W.1.
Bankers: Westminster Bank Ltd.,
Caxton House, S.W.1.

"CYCLONE" FANS

[illegible]



[illegible]

[illegible]

[illegible]

[illegible]